Towards a broader user adoption of Mobility as a Commons in Amsterdam

Graduation report, February 2025
Seamless personal mobility lab

Babette van Lieverloo

Faculty of
Industrial Design Engineering



TU Delft

TOWARDS A BROADER USER ADOPTION OF MOBILITY AS A COMMONS IN AMSTERDAM

A strategic roadmap for the seamless integration of Mobility as a Commons in Amsterdam

Graduation report, February 2025
Seamless Personal Mobility Lab

Babette van Lieverloo

COLOPHON

Delft University of Technology
This report is part of the Seamless Personal Mobility Lab

February 2025

Author
Babette van Lieverloo

Project coordination
Msc J.D. Pék

Academic supervisors
Dr. Ir. S. Hiemstra-van Mastrigt

Ir. G.P.M. Hoekstra Eur. Erg.

Project executor
Babette van Lieverloo

Project partner
Smart Mobility Program, The Municipality of Amsterdam

Image front page edited by author, photograph from (Gemeente Amsterdam, n.d.)

PREFACE

Dear Reader,

This thesis concludes my Master's program in Design for Interaction at the faculty of Industrial Design Engineering at Delft University of Technology.

I am deeply grateful to the Smart Mobility Program for making this project possible. It allowed me to combine my passion for innovative mobility, sustainability, and human-centred design while enhancing my strategic thinking skills. It allowed me to apply my skills in 'the real world'. It has taught me to get out of my comfort zone to conduct user research and ask for my team's help. This project has deepened my dedication to sustainable, human-centred design in complex transitions, and I am excited to continue this work.

First and foremost, I want to thank my supervisory team. I have often told my family and friends how fortunate I was to work with such a supportive team. Your kindness and calmness in our meetings helped me destress. Your support kept me grounded and motivated.

Gonny and Suzanne, thank you for your invaluable feedback, advice, and time throughout this project. Your guidance helped me navigate the complexity of this project and the challenges of conducting real-world user research. The combination of your expertise has taught me how to integrate both human-centred and strategic approaches in design.

Jop, thank you for being both my supervisor and my mental support. You not only showed me how to navigate the workings of a municipal organisation but also encouraged me to view the internship as a broader learning experience. I especially appreciate how you encouraged me to take necessary breaks and how you have always shown confidence in me.

To my colleagues from the SMP team, your expertise and teamwork taught me valuable lessons, from co-creation and behavioural design to professional collaboration. I am grateful for your support and contribution.

To all the experts and participants involved in the research, thank you for your time and contribution. From sharing your insights to participating in interviews and workshops, your input shaped this project. This thesis would not have been possible without you.

Lastly, a special thank you to my family and friends for listening to my thoughts time after time. Your patience, understanding, and encouragement have motivated me throughout the project.

Enjoy reading!

Babette van Lieverloo

EXECUTIVE SUMMARY

The capital of the Netherlands, Amsterdam, faces significant urban mobility challenges, including high parking pressure, limited urban space and growing social inequality in mobility access. The Smart Mobility Program of the Municipality of Amsterdam envisions a more accessible, sustainable and safe mobility system, which asks for a mobility transition. Shared mobility, an alternative to private car ownership, plays a key role in the transition. This graduation project, conducted in collaboration with the Smart Mobility Program, explores the potential and broader adoption of Mobility as a Commons (MaaC), a cooperative concept where residents collectively manage, own, and share vehicles. Based on the principles of Commons, MaaC offers a community-driven bottom-up approach to shared mobility that is affordable, accessible, contributes to social cohesion and sustainable resource management.

Project goal

The project's goal is to design a human-centred strategy that drives the broader adoption and integration of MaaC by addressing the mobility needs, motivation, and barriers of Amsterdam residents. While the current approach to MaaC primarily focuses on practical aspects such as insurance, permits, and parking, this research bridges the gap by adopting a human-centred approach to the design of the strategic roadmap.

Research approach

A multi-method research approach has been applied, including literature review, desk research, expert interviews, observations, surveys and co-creation sessions. To understand what and how to design, research was conducted on Amsterdam's mobility system, behavioural change, and cooperative sharing. Generative user research was conducted on residents' needs, motivations and barriers ensuring a human-centred approach.

Findings

The findings show that MaaC is a viable, feasible and desirable mobility for both the Municipality and its residents. It has the potential to be a valuable tool in Amsterdam's mobility transition, addressing key challenges such as parking pressure, affordability and accessibility. However, barriers such as unfamiliarity, finances, organisational complexity, habitual mobility behaviour and attachments to private cars hinder broader adoption.

To address these challenges, the project studies four behavioural change theories to understand how to design for behaviour change and comprehend the complexity of the various contexts.

In addition to the theoretical insights, user research on two neighbourhoods in Amsterdam provided valuable insights into the various residents' needs, motivations and barriers of Amsterdam residents. It revealed the various attitudes towards shared mobility, where one neighbourhood was open to it, and the other neighbourhood was unfamiliar and hesitant with it. The findings underscore the importance of a context-specific approach and the key role of the Municipality.

All these insights have been translated into six need-based personas that form the foundation of the human-centred design approach.

Strategic roadmap
To guide the Municipality, a strategic roadmap was designed. It provides a structured, human-centred framework for stimulating broader adoption, focusing on key resident groups and tailored strategies for various contexts. The Diffusion of Innovation theory provided a framework for managing the complexity of the various needs and attitudes across different resident segments. It helped integrate the various adopter segments through the need-based personas into the roadmap. Both early adopters of shared mobility and more hesitant resident groups are considered, demonstrating that MaaC can be successfully adopted in various contexts.

Expert validation and iterative feedback ensured that the roadmap aligns with Amsterdam's broader mobility transition and addresses the specific needs of its residents. It works towards a future where Amsterdam's mobility system is sustainable and human-centred, where all residents have access to shared mobility, and MaaC offers affordable, accessible and community-driven shared mobility.

Role of the Municipality
The key learning is the role of the Municipality. The bottom-up approach of MaaC asks for the Municipality to take on the role of facilitator, supporter and collaborator. In the first years, an active role is needed to actively stimulate the adoption and integration of MaaC. The moment when the theoretical adoption threshold is overcome, the role of the Municipality will decrease. In practicality, this will be when more resident groups are adopting MaaC and initiatives are established in new neighbourhoods.

Key activities for the Municipality
In this role, key activities from the Municipality are expected. This includes creating the necessary infrastructure, implementing supportive policies, and introducing incentives to promote sustainable behaviour. Simultaneously, private car ownership should be discouraged. By collaborating with MaaC initiatives, the Municipality can learn what works and identify areas for improvement, ensuring that MaaC becomes a desirable option for a diverse group of residents.

By reducing reliance on private vehicles and offering affordable, accessible and community-driven mobility, MaaC has the potential to be an effective tool in Amsterdam's mobility transition towards the envisioned sustainable city.

LIST OF ABBREVIATIONS

EU	European Union
EVs	Electric Vehicles
GDPR	General Data Protection Regulation
GVB	Gemeentevervoersbedrijf
KvK	Chamber of Commerce
MaaC	Mobility as a Commons
MaaS	Mobility as a Service
NS	Nederlandse Spoorwegen
SES	Socio Economic Status
SMP	Smart Mobility Program

LIST OF DEFINITIONS

Accessibility

In this project, accessibility refers to the ease with which people can access mobility services and transport themselves.

Active mobility

Active mobility refers to modalities that rely on human physical activity, such as walking or bicycling.

Autonomy

The independence from others and control over one's mobility (in this context).

Barrier

Internal or external factors that prevent a person from action.

Board member

An inidvidual part of the board that oversees the organisation and functioning (of an initiative).

Bottom-up organisation

In a bottom-up organisation, the members of the community play a central role in making decisions and organising, rather than being imposed from the top (businesses).

Community worker

Someone who works as a social assistant with vulnerable groups and visits them. They try to improve the social situation's by listening and by providing information and advise.

Cooperation

In this context it is a MaaC group where multiple residents collaboratively manage, share, and use vehicles based on mutual agreement.

Cooperative sharing

Cooperative sharing is a model where a group collectively owns, manages, and uses shared resources.

Designated parking spot

A parking spot that is dedicated to for a specific vehicle or purpose

Distribution key

A mechanism to distribute costs among members ensures a structured and fair distribution based on predefined rules. In terms of MaaC, the distribution key defines the prices (fixed and variable) that members have to pay to cover the costs of the initiative.

Driver

Pushes to aim for a certain behaviour.

E-moped

An electric-powered scooter or small motorcycle.

Flexibility

The ability to adapt to varying needs without being constrained.

HUB

A HUB is a node in a multimodal mobility network, where different modalities and their infrastructures come together. It serves as a transfer point between modalities or parking for shared mobility.

Initiative

In this context is a potential MaaC group that is initiated and managed by an individual or small resident group that wants to cooperatively share their mobility.

Key element

A crucial factor that is essential for success of something.

Member

A person part of an initiative, in the jargon of shared mobility, is also known as a driver. For the readability members chosen as drivers in this report also refer to behaviour drivers.

Members council

Responsible for decision making on behalf of the initiative.

Motivation

Internal or external factors that drive a person.

Private vehicle ownership

Personally owned or leased vehicles that individuals use exclusively.

Shared mobility

Vehicles that are used by multiple people.

Socio-economic

The relationship between social and economic factors, which can affect a person's access to resources, opportunities, and services.

TABLE OF CONTENTS

Chapter 1 - Introduction 15
1.1 Mobility as a Commons 16
1.2 Project information 16
1.3 Reading guide 17

Chapter 2 - Context analysis 21
2.1 Research approach 22
2.2 Mobility in Amsterdam 23
2.3 Shared mobility 26
2.4 Commons 29
2.5 MaaC exploration 32
2.6 Conclusion 38
2.7 Design insights 39

Chapter 3 - Behaviour analysis 41
3.1 Research approach 42
3.2 Mobility behaviour 43
3.3 Behaviour change theories 44
3.4 Conclusion 49
3.5 Design insights 49

Chapter 4 - Cooperative sharing analysis 51
4.1 Research approach 52
4.2 Cooperative sharing initiatives 53
4.3 Nationaal Deelmobiliteitscongress 62
4.4 Housing cooperation 62
4.5 Conclusion 63
4.6 Design insights 64

Chapter 5 - Design brief 65
5.1 Problem statement 66
5.2 Design vision 66
5.3 Design goal 66
5.4 Design criteria 67

Chapter 6 - User segmentation 69
6.1 Approach 70
6.2 Prepare selection 71
6.3 Select the neighbourhoods 73
6.4 Conclusion 76

Chapter 7 - Resident analysis 77
7.1 Research approach 78
7.2 Pilot with experts 82
7.3 Insights Bellamybuurt 85
7.4 Insights Lodewijk van Deysselbuurt 89
7.5 Conclusion 94
7.6 Design insights 95

Chapter 8 - Design the roadmap 97
8.1 Design approach 98
8.2 Design requirements 99
8.3 Need based personas 100
8.4 Future vision 103
8.5 Ideation sessions 104
8.6 Conclusion 107

Chapter 9 - Optimise the roadmap 109
9.1 Optimisation approach 110
9.2 Expert feedback 111
9.3 Supervisory feedback 115
9.4 Conclusion 118

Chapter 10 Final proposed design 119
10.1 Strategic horizons 120
10.2 Visual and strategic roadmap 121
10.3 Roadmap elements 125
10.4 Additions to roadmap 152
10.5 Implementation 155

Chapter 11 - Discussion and conclusion 157
11.1 Discussion 158
11.2 Conclusion 161

Process reflection 163

References 165

Appendices 173

1.

INTRODUCTION

This opening chapter introduces the graduation project on the broader adoption of Mobility as a Commons in Amsterdam. It aims to provide insight into the foundation of the project. The project topic, Mobility as a Commons, is introduced. Then the project information including the problem statement, the goal and the scope are presented. An overview of the project stakeholders is provided, followed by the project approach. The chapter concludes with a reading guide. The initial project brief can be found in Appendix A.

1.1 MOBILITY AS A COMMONS

1.2 PROJECT INFORMATION

1.3 READING GUIDE

1.1 MOBILITY AS A COMMONS

The Municipality of Amsterdam is exploring the shared mobility concept of Mobility as a Commons (MaaC) as a sustainable tool to support the mobility transition. MaaC is a cooperative concept where residents collectively manage, own, and share vehicles (see Figure 1). This non-profit approach allows residents to have control over their mobility.

The Municipality's primary goal of MaaC is to provide affordable, accessible, and community-driven mobility to its residents. MaaC should contribute to decreasing the number of cars on the streets, free up space for alternative use such as playgrounds or active mobility, increase social cohesion, and preserve residents' mobility autonomy.

The interest of the Municipality in MaaC stems from the eHUBS-project of the Smart Mobility Program (SMP, see section 1.2.3). The MaaC team discovered the desire for residents to have ownership over their mobility. This inspired the exploration of MaaC as a tailored solution to Amsterdam's mobility transition and residents' needs.

1.2 PROJECT INFORMATION

1.2.1 Problem statement

The current approach to MaaC is primarily designed with a practical focus, addressing aspects such as insurance, permits, and parking. At the moment, the main user group is limited to those who act from an idealistic perspective, are initiative-taking and are willing to explore new concepts. This group is willing to collaborate with the Municipality to navigate the challenges and improve MaaC.

However, MaaC has the potential to be valuable for a much broader range of residents. To achieve this, the right strategies must be implemented to engage and involve these residents to create a concept that complements diverse needs and preferences which is essential for broader adoption. Therefore, successful integration of MaaC necessitates a step towards human-centred design by understanding and addressing the needs and preferences of (potential) users.

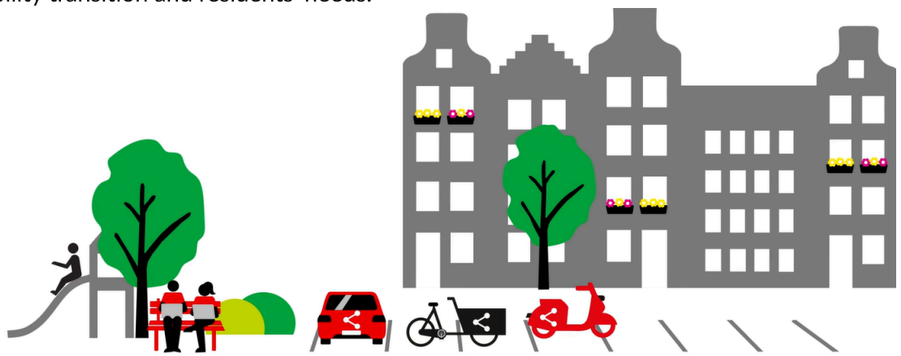


Figure 1 – A visual impression of MaaC vehicles in a street (Gemeente Amsterdam, 2024).

1.2.2 Project goal and scope

The primary goal of this project is to develop a service strategy that drives the broader user adoption of MaaC in Amsterdam. The aim is to determine if MaaC is a viable tool in Amsterdam's mobility transition. If so, identify what strategy is needed to make it more accessible and user-friendly. The knowledge gap between practical and human-centred is bridged by identifying potential residents' groups and their mobility needs, motivation, and barriers to MaaC adoption.

The project's scope focuses on MaaC and (potential) user groups, emphasising its application within Amsterdam's urban context and mobility system.

1.2.3 Project stakeholders

The project involves a range of stakeholders at multiple levels of interest. Figure 2 shows the direct stakeholders for the project's scope. The two primary stakeholders are the SMP from the Municipality of Amsterdam, further referred to as the Municipality, and the residents of Amsterdam.

Smart Mobility Program

The Municipality is organised in five clusters, an executive and central staff, seven districts and one city area. Each cluster has an expertise in a specific area, such as education, data or parking. These clusters develop city-wide policy frameworks within which the district clusters can do the executive work.

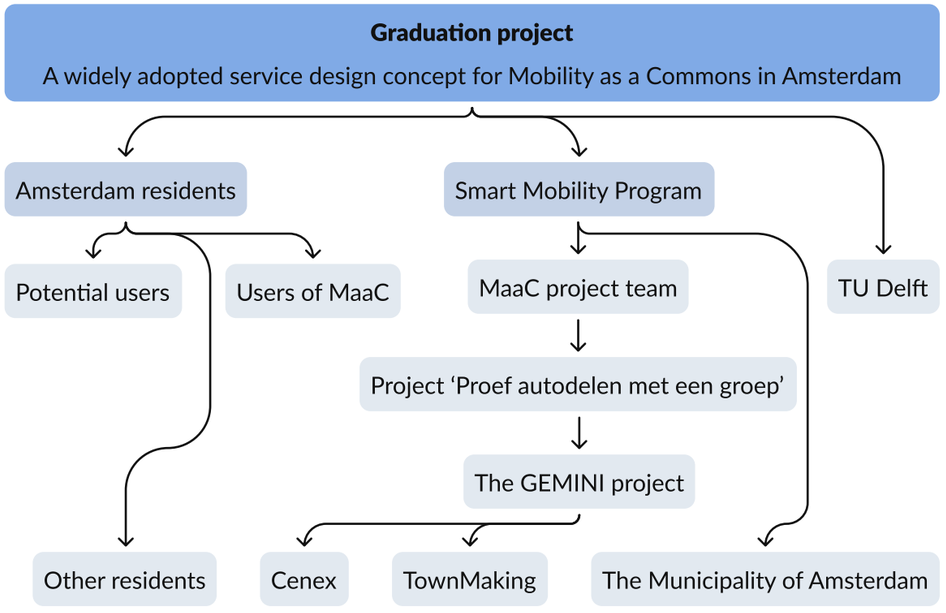


Figure 2 – A schematic overview of how MaaC works in short.

They also provide direct support to residents (Gemeente Amsterdam, n.d.-b). The SMP, the client and provider of the assignment, is a team which is part of the innovation department of the cluster digitalisation, innovation and information.

The team is dedicated to shaping Amsterdam's future mobility system in collaboration with residents, visitors, and public and private parties (Gemeente Amsterdam, 2019). The MaaC project team oversees the exploration of MaaC in the trial 'Proef autodelen met een groep'. This graduation project will contribute by providing valuable insights into human-centred design and strategy to guide further development of MaaC.

Amsterdam residents

Amsterdam residents are the (potential) primary users of MaaC. Their willingness to adopt the concept is critical to the success of integrating MaaC in Amsterdam. This project aims to understand and design for their mobility needs and preferences. If successful, MaaC offers multiple potential benefits to residents such as mobility autonomy, increased social cohesion, decreased parking pressure and affordable mobility.

Related projects

The trial 'Proef autodelen met een groep' is aimed at the exploration of MaaC in Amsterdam's urban context (Gemeente Amsterdam, 2024). Part of this trial is the GEMINI project, a European research project that develops and tests sustainable business models for new mobility services

Across eight living labs, of which Amsterdam is one (Gemini, 2024). For this project, the SMP receives financial support to run the trial.

Within the GEMINI project, five initiatives can apply to be part of the trial and receive support from a MaaC expert for the foundation and organisation. In exchange for the support, the partaking initiatives are asked to collaborate with the MaaC team to share their experiences for the team to learn and improve. Key stakeholders in this GEMINI project include the SMP, Cenex, and Townmaking. Cenex, a non-profit organisation specializing in sustainable and smart mobility solutions, is responsible for shaping and advising on the MaaC policy framework (Cenex Nederland, 2024). Townmaking, an organisation that emphasizes the power of Commons, contributes extensive expertise in this area and supports the MaaC initiatives in forming and organising (Townmaking, n.d.). Together, these stakeholders collaborate to explore and evaluate MaaC in the context of Amsterdam.

There is also room for initiatives to take part in the trial without being included in the GEMINI projects. These initiatives will not receive the support but can make use of the MaaC framework that is established. The initiatives can apply for a MaaC permit and parking spot if they align with the set framework (read section 2.4.6 for more details).

1.2.4 Project approach

The project's approach adopts the Double Diamond principle, which is a user-centred outcome-based framework of converging and diverging thinking that is used for problem identification and developing solutions, while creativity and innovation are encouraged (Design Council, n.d.). The principle provides guidance and structure for the design process. The project's key phases are defined according to the principle (see Figure 3).

Phase 1 - Discover

The first phase aims to provide an understanding of what the problem is. An analysis of the context and user behaviour is conducted in combination with an exploration of MaaC initiatives to gain a better and deeper understanding of the context, MaaC and its users.

Phase 2 - Define

This phase aims to define the problem. Findings and insights are defined in a design brief, which leads to the next phase.

Phase 3 - Develop

The third phase aims to explore ideas and solutions for the defined problem and design goal. Two potential neighbourhoods are identified via user segmentation. User research provided insights into needs, motivations, and barriers which were defined into need-based personas. Through an exploration of the design brief and need based personas with multiple design methods a strategic roadmap is designed.

Phase 4 - Deliver

The final phase concludes the project and the design is evaluated and optimised. To ensure that the strategic roadmap fits the context, stakeholders and residents, the design proposal is evaluated by experts through feedback sessions. The final design is proposed with a conclusion and recommendations for further research.

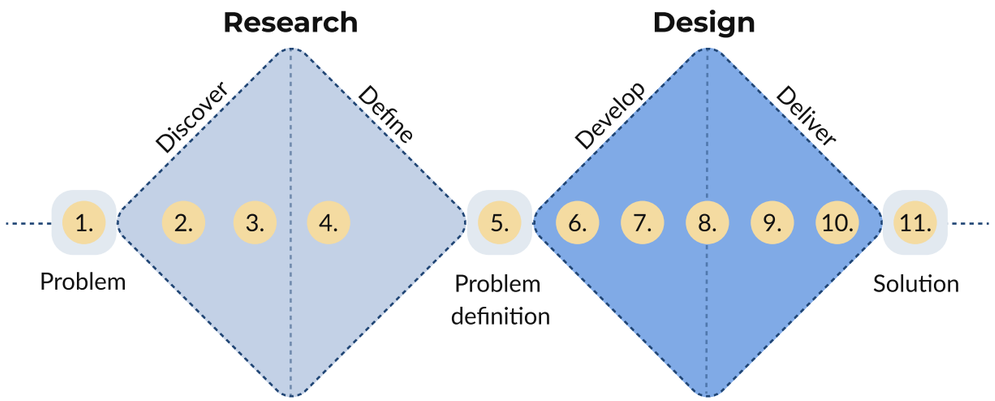


Figure 3 – A visual representation of the Double Diamond approach with the four key phases and the chapters.

1.3 READING GUIDE

The report includes specific jargon, definitions and abbreviations. To enhance readability a list of definitions and abbreviations is included at the beginning of the report.

The structure of the report follows the Double Diamond approach (see Figure 3). Each chapter starts with an introduction and a research approach followed by the content sections and concludes with a conclusion. Chapters two, three, four and seven also conclude with design insights.

A diverse range of research and design methods have been used throughout the project. The specific approach and methods are highlighted at the start of each chapter. The first time a method is described, a detailed definition and reason for use is provided.

To visually support and enhance the content, specific design elements have been added. See Figure 4 for the design elements with an explanation. Icons used throughout the report have been created by the author based on inspiration from Flaticon (Flaticon, n.d.).

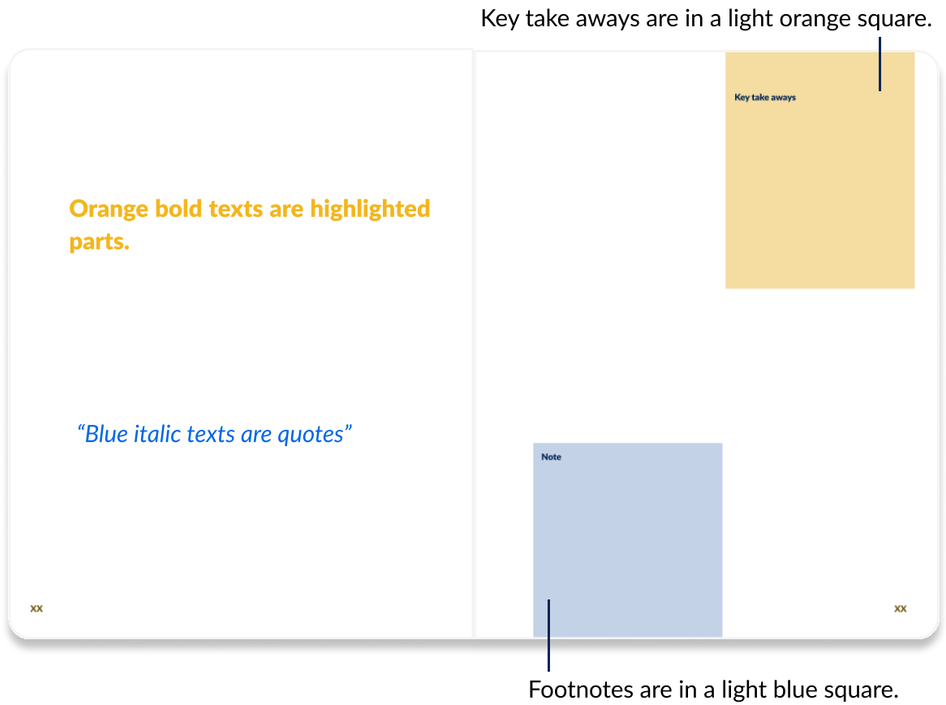


Figure 4 – A visual representation of the design element utilised in the report to enhance the content.

2.

CONTEXT ANALYSIS

This chapter provides an analysis of the current context and the various layers of the defined problem. It starts with an exploration of Amsterdam's mobility system and its challenges. Then shared mobility and Commons are introduced. Followed by the introduction of fractional ownership, as a form of shared mobility, that builds up to a detailed exploration of the possibilities and challenges of MaaC. The MaaC section concludes with an explanation of the 'Proef Autodelen met een groep'.

2.1 RESEARCH APPROACH

2.2 MOBILITY IN AMSTERDAM

2.3 SHARED MOBILITY

2.4 COMMONS

2.5 MAAC EXPLORATION

2.6 CONCLUSION

2.7 DESIGN INSIGHTS

2.1 RESEARCH APPROACH

To conduct the context analysis, multiple research methods have been applied. A combination of desk research, literature review and expert interviews provided valuable insights from different perspectives (see Figure 5).



Figure 5 – Icons from left to right representing desk research, literature review and interviews.



Desk research

Desk research was performed to gain information on the topic, learn about the stakeholders and gain an understanding of the current context and situation. For the desk research, all documents and knowledge of the MaaC team were used.



Literature review

A literature review was performed to gain an understanding of the existing research on the context and topic. It helped me gain and build knowledge on the topic and highlight knowledge gaps. For the exploration, the academic search engine Google Scholar was used to find relevant literature papers (Google Scholar, n.d.). The following key terms were used: Mobility as a Commons, Commons, shared mobility, fractional ownership mobility, mobility systems, and sharing economy.



Expert interviews

Expert interviews were conducted to gain an understanding and insight into both Commons and MaaC (van Boeijen et al., 2013). A semi-structured interview method was used to provide consistency and flexibility. The predefined questions ensured a coherent focus across the interviews, while the open structure allowed for follow-up questions and for participants to elaborate on their experiences and provide detailed insights (see Appendix B for the predefined questions, Dingemanse, 2015). For analysis, the interviews were recorded, transcribed, and coded. The coding software of ATLAS.ti was used for coding (ATLAS.ti, n.d.). Two interviews were conducted with an expert on Commons, who is referred to as interviewee AmsterDOEN[1], and an expert on MaaC and a stakeholder from Townmaking, who is referred to as interviewee Townmaking.

[1] AmsterDOEN is a program from the Municipality that aims at a city where ownership and control are close to Amsterdam residents and those who want to be active in their neighbourhoods. The program is committed to the integration of Commons (AmsterDOEN - Samenwerken Aan Sociale En Duurzame Stad, 2022).

2.2 MOBILITY IN AMSTERDAM

This section explores mobility in Amsterdam to gain a deeper understanding of the current system, the challenges it faces and the need for the mobility transition.

2.2.1 Mobility system

Amsterdam's mobility system consists of a combination of cars, public transport, shared mobility, bicycles, pedestrians and others (see Figure 6).

Daily, diverse types of users, residents, workers, and tourists, with each unique need engage with the mobility system (Gemeente Amsterdam, 2013). This research focuses on the mobility of Amsterdam residents. Figure 7 shows the modal split of residents in Amsterdam in 2019, bicycles (bright blue) are the most used with 38%.

Amsterdam's public transport infrastructure operators consist of the Nederlandse Spoorwegen (NS) for train services and multiple operators, including the Gemeentevervoerbedrijf (GVB), R-net, and Connexxion collectively manage an extensive network of trams, metros, ferries, and busses. The infrastructure provides transport within the city and connects the city with surrounding regions. Figure 8 illustrates the distribution of public transport in Amsterdam, where the GVB alone transport almost a million passengers on working days (GVB, 2022).

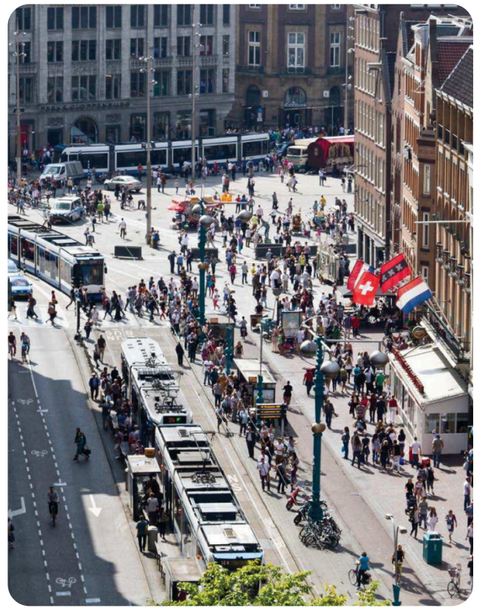


Figure 6 – A photograph of a part of Amsterdam showing several types of modalities in the city (Gemeente Amsterdam, 2013).

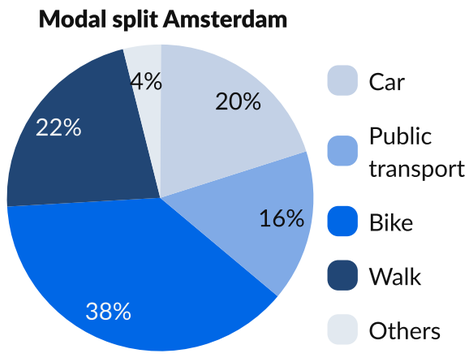


Figure 7 – A circle diagram that shows the modal split in percentages for different types of modalities in Amsterdam by residents. Figure created by the author based on data from (Gemeente Amsterdam, 2021c).

In addition to public transport, Amsterdam offers an extensive range of shared mobility. In 2022 approximately three thousand shared vehicles, such as (e-)bikes, e-mopeds, and cars, are provided by multiple commercial providers (Gemeente Amsterdam, 2022).

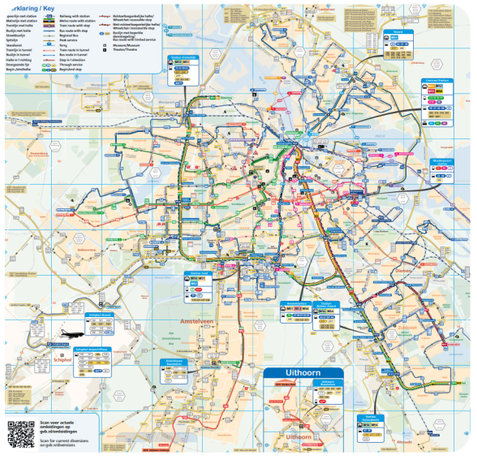


Figure 8 – A map that shows all the types of public transport distributed in Amsterdam (GVB, 2024)

2.2.2 Vision on Amsterdam

The SMP envisions Amsterdam as a city with a well-balanced public space that prioritises liveability, clean air, green spaces, and accessibility (see Figure 9). The primary goal is to improve the mobility system's accessibility, sustainability and safety while actively shaping the living environment in collaboration with residents. Actions are taken to reduce the number of cars on the streets and increase space for pedestrians and cyclists (Gemeente Amsterdam, 2019).

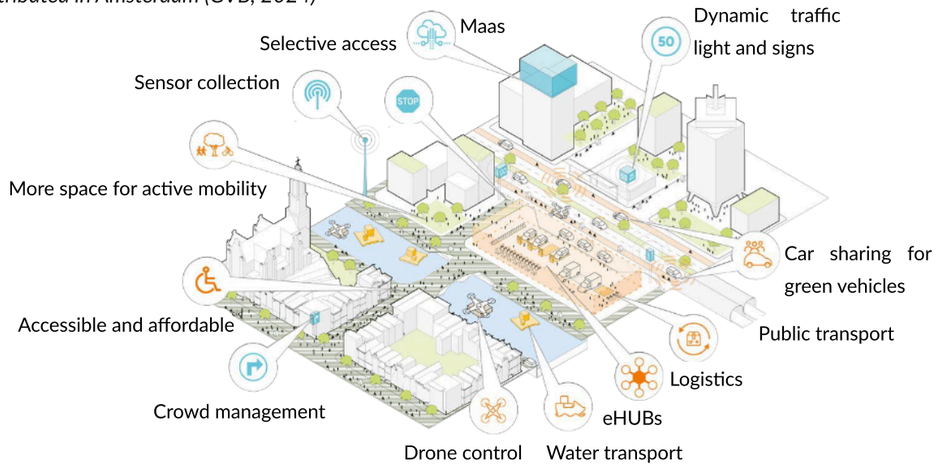


Figure 9 – A visual representation of SMP's vision for the urban space with highlighted mobility elements (Gemeente Amsterdam, 2019).

2.2.3 The need for a mobility transition

Amsterdam faces significant challenges in the coming years, especially when it comes to mobility. These challenges and the vision result in a need for the mobility transition. The following main mobility challenges need to be addressed.

Pressure on the mobility system

Amsterdam anticipates a continuous growth in population of 16% in 2050 (Prognose Bevolking 2024-2050 | Website Onderzoek En Statistiek, 2024). As a result, the pressure on the mobility system in and around Amsterdam will increase (Gemeente Amsterdam, 2019). Projections estimate a 28% rise in car kilometres over the next decade, alongside a 39% increase in bicycle usage and a 40% rise in public transport usage (Gemeente Amsterdam, 2023).

Non-future-proof mobility system

The current system is not future-proof and contributes to the increase of social inequality. Mobility is a fundamental need in life, yet many residents underestimate its significant financial burden (interview Townmaking). Research indicates that the price of mobility has increased by 30% over the past eight years and that 10% of Dutch adults have problems paying for mobility. This mostly includes individuals with a lower income (Krabbenborg and Durand, 2024).

Parking pressure

Fluctuations in car use have led to an increase in parked cars across the city. Despite the availability of a distributed public transport system, high dependency on bicycles and the relatively low car ownership rate of 0.21 cars per person, parked cars still consume substantial urban space (Gemeente Amsterdam, 2021c). In combination with scarce urban space, the parking pressure has increased (Gemeente Amsterdam, 2013).

Redistribution of urban space

The city's growth and vision necessitate a redistribution of the urban space for sustainability, safety and social inclusivity (Gemeente Amsterdam, 2023). Cars occupy around 15 square meters each, while bicycles only need 2 square meters (Meer Auto's Maar Minder per Amsterdammer | Website Onderzoek En Statistiek, n.d.). The difference in the occupation of urban space raises critical questions. The division of space is a deliberate choice, in which currently cars are the priority (see Figure 10). The Municipality is aiming for reduced car density which underscores the broader question of how and for whom urban space should be used (interview AmsterDOEN).



Figure 10 – On the left the current division of urban is shown, on the right the envisioned new division of space is shown (Gemeente Amsterdam, 2023).

2.2.4 The STOMP principle

To address these challenges, the Municipality is adopting more sustainable solutions which aim to shift from private ownership to access. To make urban spaces more accessible, inclusive, and sustainable, the Municipality adopts the STOMP principle as a guide for the mobility transition (Goudappel, n.d.). The STOMP principle is built from the Dutch terminology for the modals, so the letters stand for the Dutch translations. The approach puts humans at the centre by prioritizing Stappen (walking), Trappen (cycling), Openbaar vervoer (public transport), and Mobility as a Service (MaaS) over Privé auto (private car) (see Figure 11).

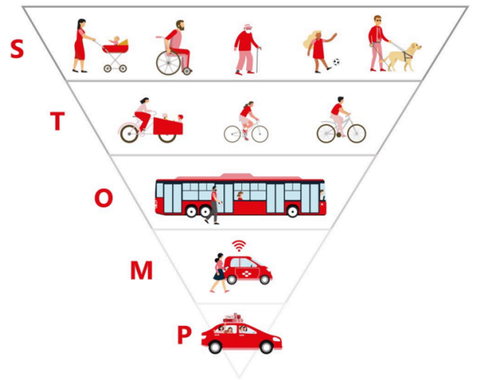


Figure 11 – A visual of the STOMP principle (Goudappel, n.d.).

The solution to sustainable mobility is a combination of public transport (government), commercial shared mobility (business) and cooperative shared mobility (people) (interview AmsterDOEN).

2.3 SHARED MOBILITY

A key driver in the mobility transition is the development of shared mobility which aligns with the transition from private ownership to access. This section dives into the concept of shared mobility, its benefits and challenges and its various forms.

2.3.1 Definition of shared mobility

Shared mobility offers users short-term access to a shared vehicle at the users' need and convenience without the need for private ownership (Shaheen et al., 2015). Users typically pay based on usage covering all the costs, including insurance, maintenance, and fuel. Shared mobility aims to maximise the utilisation of vehicles by promoting access over ownership (Machado et al., 2018). Rooted in the principle of the sharing economy, shared mobility emphasizes the distribution of use of vehicles which promotes consumption with positive economic, social, and environmental impacts (Machado e.a. 2018).

Shared mobility users enjoy the benefits of vehicle access without the burden of ownership, such as risks and responsibilities, as these are generally covered by the service provider or shared among users (Shaheen et al., 2015). The burden of ownership, lower costs and environmental awareness are important motivations for individuals to shift from ownership to shared mobility (Schaefers et al., 2016, Khalek & Chakraborty, 2022).

2.3.2 Various forms of shared mobility

Shared mobility dates back to 1948 with one of the earliest concepts being a cooperative car-sharing service that operated in Zurich (Machado et al., 2018). Since then, shared mobility has evolved to include a wide range of forms with unique traits (see Figure 12).

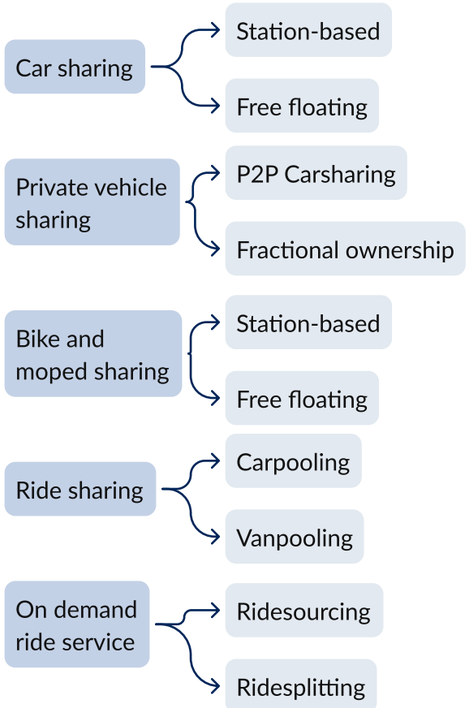


Figure 12 – A schematic overview of the several types of shared mobility. Figure created by the author based on data from (Machado et al., 2018).

The first shared electric car initiative 'Witkar' of the Netherlands was introduced in 1972 in Amsterdam (see Figure 13). Unfortunately, it was not a great success and the Witkar was removed from the streets in 1988 (The World's First Car-Sharing Vehicle of Holland, 2024).



Figure 13 – Two Witkar electric cars on a street in Amsterdam (The World's First Car-Sharing Vehicle of Holland, 2024).

2.3.2 Benefits and challenges of shared mobility

Shared mobility has several benefits and challenges across various dimensions (Doody et al., 2022, interview Townmaking). These benefits and challenges apply to shared mobility in general and might differ per form of shared mobility and user (see Tables 1 and 2).

Table 1 and 2 - An overview of the benefits (top) and challenges (bottom) of shared mobility.

Benefits of shared mobility	
Lower costs	Ownership costs including maintenance, insurance, and parking are shared by all users.
Environment	Reduced emissions and need for raw materials.
Electrification of fleets	Private electric driving is often not affordable as the investment costs are higher than fossil fuel, due to sharing of costs shared mobility contributes to the electrification of fleets.
Convenience	Diverse types of vehicles available to different user needs.
Social economic	Ability to provide mobility access to social groups who are unable to afford private ownership, which contributes to socio-economic inclusivity.

Challenges of shared mobility	
Access barriers	Many services require access to a smartphone, internet and sometimes a credit card, which can exclude some social groups.
Decreased flexibility	Compared to private ownership, it requires users to plan more in advance.
Unreliable	(Desired) vehicles may not always be available for the user.
Safety concerns	Concerns on safety and cleanliness of shared vehicles can impact willingness to use shared mobility.
Responsibility	Users may not feel as responsible for the vehicles, which can lead to irresponsible behaviour.
Inconvenience	Assembling and disassembling personal items, such as child seats, can be inconvenient.
Coverage ratio	The current business case of commercial parties limits the coverage to highly urban areas excluding less dense areas.

2.4 COMMONS

The mobility transition asks for a more sustainable approach towards mobility. A model for sustainable management is the concept of Commons, which advocates for shared management of resources. Mobility is a resource that can be organised in the Commons. This section dives into the definition of Commons, its benefits and challenges and the key elements for its success, to gain a better understanding of Commons in general before diving into Commons and mobility.

2.4.1 Definition of Commons

Commons refers to a way of living where resources are shared and managed by a group of people under agreed-upon arrangements. These resources can range from natural elements, such as fisheries, to more urban settings, such as housing. Commons relies on collective organisation to ensure shared access and sustainable use of resources (Agrawal et al., 2013). Historically mostly rural Commons have been explored, however, in the past years Commons has evolved (Blomley, 2008). Modern initiatives are often driven by the vision to create liveable, inclusive, and sustainable urban spaces (interview AmsterDOEN).

Commons reflects an alternative way of thinking about resource use and management (interview AmsterDOEN). It presents a viable and sustainable alternative to conventional resource management (Agrawal et al., 2013). Commons principles align with those of the circular economy, which emphasises reduced resource exhaustion while prioritising the well-being of both people and the planet (interview AmsterDOEN).

Commons are not merely a way of resource management, it is a model for social organisation. According to Elenor Ostrom, a key Figure in the Commons research, the success of Commons relies on the ability of communities to collectively manage their resources, depending on collective agreements and self-management (Ostrom et al., 2002). Members must agree on how, when and by whom the resources can be used (Ostrom, 1990).

Her work contradicts the 'Tragedy of the Commons' proposed by Hardin. His work describes a situation where individuals with access to a shared resource act in their interest and ultimately exhaust the resource. According to the tragedy, individuals prioritise their own needs when making decisions, even if it negatively affects others. The uncertainty of what other individuals will do and the fear of missing out on shared resources drives the tendency to overuse the resources for personal benefits (Hardin, 1968). An example is overfishing which currently reduces the population of some species (Tragedy of the Commons, 2019).

Commons are creative solutions that are complex and therefore a helpful solution for society's complex challenges. Ostrom states that it is not a good idea to have simple solutions for complex problems (Ostrom, 1990).

2.4.2 Benefits and challenges of Commons

Commons offer significant benefits yet face significant challenges. See Tables 3 and 4 for an overview of the benefits and challenges of Commons (Agrawal et al., 2013, interview AmsterDOEN).

Table 3 - An overview of the benefits of Commons.

Benefit of Commons	
Sustainable resource management	Shared resources allow for improved conservation due to the long-term interest of individuals.
Fair benefit distribution	Involving users in decision-making processes helps to ensure that resource management reflects community needs and promotes fair access.
Enhanced resilience	Collective management fosters and depends on social cohesion, trust, and mutual support.
Empowerment	Giving users the right to manage their resources empowers them and gives them a sense of responsibility.
Cultural and social benefits	Commons reinforce cultural identity, establish social activities and preserve knowledge.

Table 4 - An overview of the challenges of Commons.

Challenges of Commons	
Collective action	One of the major challenges in managing Commons is the potential for individuals to prioritize their short-term interests over the long-term collective good, leading to resource overuse.
Power differences	This can lead to inequality in the group.
Culture and social heterogeneity	Different norms, values, or interests of individuals can lead to conflict.
Enforcement challenges	Effective governance of Commons requires enforcement to ensure rules are adhered to.
External pressures	External developments can put pressure on common resource management such as a decrease in prices of commercial products.
Lack of recognition and support	This can lead to the undermining of legitimacy.

2.5 MAAC EXPLORATION

The need for a mobility transition has led to an exploration of organising shared mobility in Commons, MaaC. This section dives into MaaC by exploring its potential and its current application in Amsterdam. It starts with an introduction to fractional ownership and a comparison of MaaC and commercial sharing is provided.

2.5.1 Introduction to MaaC

Fractional ownership, shown in Figure 12, is a cooperative shared mobility model where a closed group of individuals collectively owns and shares vehicles. The expenses including maintenance, insurance, and operational costs are distributed among the members (Shaheen et al., 2015). Fractional ownership demonstrates how bottom-up initiatives can generate access to services or goods more sustainable, affordable and efficient compared to private ownership (Pasimeni, 2021). However, for fractional ownership to remain an interesting form of mobility for residents, it must offer benefits over commercial alternatives (e.g. lower prices) (Pasimeni, 2020). Municipalities can develop supportive policies and offer incentives, such as designated parking, to facilitate and stimulate the adoption. Fractional ownership could particularly benefit low-income individuals and commuters with limited access to public transport (Pasimeni, 2020).

MaaC builds on the principles of fractional ownership by introducing mobility organised in Commons, a cooperative, community-driven shared mobility concept. With MaaC residents collectively owning, managing and share the vehicles and costs, applying the social organisation of Commons.

2.5.2 Potential of MaaC

According to the MaaC team, MaaC holds the potential to address the following eight urban challenges. For this graduation project, the focus is placed on the socio-economic and accessible benefits of MaaC.

Socio-economic

In smaller cities, suburban areas or areas with a lower socioeconomic status (SES)[2] it is seen that shared mobility is often unavailable, mostly due to the lack of a business case for the providers. MaaC can fill this gap as communities can share in a non-profit organisation.

Environmental

Transport is the main contributor to poor urban air quality in the city. By 2030 the Municipality aims to become a climate-neutral city. MaaC supports Amsterdam's goal to transition to electric vehicles as access to electric vehicles becomes more financially accessible due to shared costs.

Accessibility

Access to mobility should be a common good. The business model of MaaC does not evolve around creating a close to 100% occupancy per asset, therefore it can serve less dense suburban areas.

[2]Social-economic status is the relationship between social and economic factors, which can affect a person's access to resources, opportunities, and services.

Gender and inclusion

Most shared mobility tools are not equipped with the right tools to accommodate people with special needs. MaaC can be tailored to their needs.

Safety and security aspects

Unlike commercial parties, with MaaC the community becomes the owner of their data.

Mobility Awareness

The community becomes more aware of their travel behaviour and is encouraged to shift to more sustainable mobility.

Health

Air pollution is a large health risk. Due to the decrease in emission vehicles, the air pollution could decrease.

Urban design

Shared mobility reduces private car ownership, which can free up urban space for other purposes such as green areas or active mobility.

The following two potentials are acknowledged by an expert on MaaC.

Community potential

MaaC also offers residents the opportunity to contribute to their neighbourhood and foster community ownership (interview Townmaking). Initiatives may go beyond merely sharing mobility by sharing other resources or organising community events.

Scale potential

The growth of MaaC holds a lot of potential in the future. In case MaaC expands and distributes over a city, initiatives can collaborate to strengthen and scale new potential initiatives. For instance, initiative A in neighbourhood A could slowly expand to neighbourhood B. By sharing knowledge about MaaC, more residents from Neighbourhood B could become interested and apply for initiative A. The members of this initiaive could mentor and financially support the new members from neighbourhood B until they become a self-sufficient initiative and split. This peer-to-peer model can reduce costs and foster community involvement (interview Townmaking). See Figure 14 for a visual representation of the example.

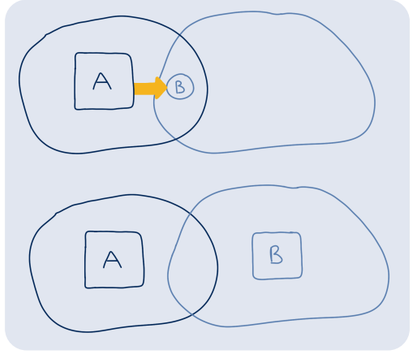


Figure 14 – A visual representation of the peer-to-peer model for distribution of MaaC. The top sketch represents the first step of sharing knowledge, the bottom sketch represents the splitting of initiative B form A into a self-sufficient initiative.

2.5.3 Behaviour shift

MaaC represents a transition rather than a revolution in mobility. Changing the car-dominant culture that has developed over a hundred and twenty-five years requires a shift in behaviour which will take time (interview Townmaking, Gemeente Amsterdam, 2023).

Over decades, individuals have been encouraged to outsource problems to market-driven solutions (interview Townmaking). MaaC challenges this mindset by asking residents to take an active role in managing shared resources. This behavioural shift requires time (Interview Townmaking).

"See, it is a culture change we are trying to shape and that simply needs a lot of time before it finds a broader way through society."
– Interviewee Townmaking

2.5.4 Municipal role in MaaC

Despite its potential, MaaC faces some key challenges. For the Municipality, allocating parking permits to MaaC can raise concerns when other residents or commercial parties compete for the same permits. This should be treated carefully.

For residents, barriers to adoption include lack of sustainability awareness, limited time, financial constraints, and unfamiliarity with MaaC (interview AmsterDOEN, interview Townmaking). Municipalities can play a key role in addressing these issues by fostering trust, offering transparent communication on policies, formal recognition, and providing support (interview AmsterDOEN).

Providing support is particularly important in neighbourhoods where residents face socio-economic challenges, such as financial barriers, as these residents may not have the mental space to reconsider or self-organise their mobility (interview Townmaking). Local community workers can play an important role in helping these resident groups establish MaaC initiatives by providing organisational support. This approach ensures that MaaC is accessible to all residents, not just those with the time and resources to self-organize (interview Townmaking).

"If it is possible to let people save a certain amount of money while maintaining the same access to mobility, MaaC has the potential to have a big positive impact on people's life."
– Interviewee Townmaking

2.5.5 Comparing MaaC and commercial sharing

As mentioned in section 2.2.1 shared mobility in Amsterdam is currently mostly provided by commercial parties. While commercial car sharing is often described as "shared mobility", it operates more like a rental system. Members pay a certain amount to use the commercially owned vehicle for a certain period. MaaC differs fundamentally from these commercial models (interview Townmaking). A MaaC vehicle is owned by all members of the initiative, which is then shared among all members.

The following Table 5 provides an overview of the differences between commercial and MaaC.

Table 5 – An overview of the differences between commercial and cooperative sharing per theme (interview Townmaking).

	Commercial sharing	MaaC
Ownership	A private company own vehicles	Members collectively own vehicles
Pricing	Fixed, profit-driven pricing structure	Members decide on costs distribution and can fluactuate
Control	Limited user involvement in decisions	Members decide vehicle type, costs, and rules
User involvement	Minimal involvement and effort required	Members manage organisation collectively
Privacy	Data is owned and used by the company	Data is owned and controlled by the community
Business model	Create supply, then demand	Create demand, then supply

2.5.6 The MaaC trial

As mentioned previously, SMP is exploring MaaC in context through the trial “Proef autodelen met een groep”. For the trial, one hundred and fifty parking spots have been reserved for MaaC vehicles. Initiatives can apply for a free parking permit and a fixed parking spot. The Municipality has established two sets of requirements frameworks: one for participation and one for the parking permit and spot (Gemeente Amsterdam, 2024).

Policy framework for participation:

- The group is organised as a cooperation.
- The cooperation is registered at the Chamber of Commerce (KvK).
- The cooperation does not have a profit goal.
- The vehicles and insurance(s) are registered in the name of the cooperation and managed by the cooperation.

Requirement framework for parking spot and permit:

- The vehicles are owned by or leased by the cooperation.
- The initiative has at least five voters each registered at a unique address in the permit area the permit is applied for.
- The shared car complies with the environmental requirements for a personal car in Amsterdam.
- The car-sharing group complies with the rules of the General Data Protection Regulation (GDPR).
- The car-sharing group is willing to work with the Municipality for an evaluation of the trial.

Amsterdam has parking permits for various areas in the city. A permit allows residents to park in one designated area, but they are not fixed to one parking spot. These permits in Amsterdam are scarce and expensive, with price and waiting time depending on the designated area. For example, a parking permit for the centre district costs 326,65 euros every six months and the waiting time is approximately seventeen months (Gemeente Amsterdam, n.d.-c). The free parking permit and spot are an appealing incentive for residents to consider MaaC. Next to these incentives, the following benefits MaaC offers are promoted on the website of the trial.

Promoted benefits:

- The monthly cost of a car is lower. Only pay for trips you make and share the general costs such as permits and maintenance.
- Fewer vehicles in the neighbourhood can create more space.
- Commercial parties do not have access to your data.
- You get to know your neighbours by organising your mobility together.

[3]A link to the website of ‘Proef Autodelen met een groep’: www.amsterdam.nl/autodeelgroep

The first five groups will become part of the GEMINI project and will be guided by the expertise of Townmaking. This stakeholder offers a six-month trial period with a support package of WijZijnDeel (DEEL, 2024). The trial period offers residents the chance to explore neighbourhood car-sharing without committing long-term to the responsibilities of an initiative. For six months, members experience the benefits of MaaC while gaining insight into managing such an initiative. If the concept fits, they can formalise their initiative after the trial. The costs of the trial are covered by the GEMINI funds. In exchange for the financial and expert support, the initiatives are expected to collaborate with the MaaC team to share their experiences for further improvements.

2.6 CONCLUSION

This chapter emphasises the need for a mobility transition in Amsterdam due challenges of the current mobility system and scarce urban space. Shared mobility serves as a key tool in this transition. MaaC holds the potential to be a promising alternative form of shared mobility that aligns with the Municipality's goals of reducing private ownership and parking pressure while contributing to social cohesion, affordability, and accessibility by applying the principles of Commons and fractional ownership. The bottom-up character of Commons allows residents to take control over their mobility needs. MaaC is an addition to both commercial sharing and public transport, the combination of the three plays a key role in the transition. However, challenges such as unfamiliarity, financial barriers, missing policies and organisational complexity must be addressed for the broader adoption of MaaC.

Although extensive academic research is available on both shared mobility and Commons, there is no research available specifically on MaaC. Some studies provide insights into fractional ownership, which gives supportive argumentation for the potential of MaaC. However, fractional ownership and MaaC are not identical as MaaC embraces the model of Commons going beyond merely sharing vehicles and extending to social organisation. As a result, the research of MaaC relies mainly on desk research and expert interviews, which still provide relevant and valuable insights.

Overall, MaaC has the potential to be a viable, desirable, and feasible addition for both residents and the Municipality to the mobility system of Amsterdam and an effective tool in the mobility transition. It addresses the diverse challenges of the city and complements its vision. The broader adoption requires a behaviour shift where the private car is not as dominant, this is a long-term process and does not happen overnight. The next chapters explore behaviour change to understand how to stimulate broader adoption.

2.7 DESIGN INSIGHTS

The chapter highlighted the following design insights:

Promote public and active mobility

The STOMP principle should be the base for mobility strategies, prioritizing walking, cycling, public transport, and shared mobility over private vehicle ownership.

MaaC should be an addition to commercial shared mobility and public transport

Amsterdam's mobility system should rely on a combination of commercial shared mobility, MaaC, and public transport to address mobility challenges. MaaC should be integrated alongside commercial shared mobility as an alternative form.

Improve the infrastructure and policy

Improve the system, infrastructure, and policy to stimulate the transition to shared mobility.

Focus on adressing the adoption barriers

To improve accessibility the adoption barriers should be tackled or lowered.

Define the role of the Municipality

To provide the optimal position to foster integration and broad user adoption. Municipalities can play a key role in addressing barriers.

Focus on a short and long-term plan

A short-term and long-term plan is needed to initiatie broader adoption and facilitate the slow transition as cultural shift necessitates.

MaaC can distribute over neighbourhoods

Initiatives can either continue to grow or split into multiple initiatives. MaaC initiatives have the potential to distribute from neighbourhood to another, which can lead to successful initiatives guiding and supporting new initiatives.

MaaC should have benefits over commercial to be adopted

Cooperative sharing is only interesting for users if it has clear benefits over commercial sharing.

Commons relies on key Figures

Key Figures are enthusiastic individuals that genuinely believe in Commons and stimulate others to join.

Establish formal recognition

The success of Commons relies on the formal recognition by public parties.

Parking important incentive in the context of Amsterdam

Due to all the difficulties and high prices of parking.



Crowded street with multiple modalities (Gemeente Amsterdam, n.d.)

3.

BEHAVIOUR ANALYSIS

The previous chapter emphasises the need for a transition in mobility and the role shared mobility, and thus MaaC, can play in the transition towards sustainable mobility. The aimed broader adoption of MaaC and the mobility transition require behaviour change from residents. This chapter aims to analyse mobility behaviour and explore behaviour change theories to gain a better understanding of how to design for broader adoption of MaaC. The first section explores mobility behaviour, where the car as the main barrier in the mobility transition is also explored. The second section explores four theories on behaviour change and concludes with a comprehensive design approach which combines the strengths of the theories.

3.1 RESEARCH APPROACH

3.2 MOBILITY BEHAVIOUR

3.3 BEHAVIOUR CHANGE THEORIES

3.4 CONCLUSION

3.5 DESIGN INSIGHTS

3.1 RESEARCH APPROACH

A combination of desk research, literature review, and expert interviews was applied to conduct the analysis (see Figure 15). The different methods generated insights from different perspectives.



Figure 15 – Icons from left to right representing desk research, literature reviews and interviews.

The following key terms were used for the literature review: mobility behaviour, attachment to private car ownership, behaviour change models, COM-B model, Foggs' behaviour model, Innovation theory, and S-frame and I-frame.

Additionally, an interview with an expert from Trend Team [4], part of the SMP, was conducted (referred to as Trend Team). The team conducted the 'Mobiliteitsradar' research on behaviour change in mobility parallel to this graduation project to advise the Municipality on behaviour change regulation in the mobility transition.

[4] The Trend Team is part of the SMP and performs a research research called the Mobiliteitsradar every six months. Each research dives into a specific topic concerning mobility and the Municipality.

3.2 MOBILITY BEHAVIOUR

Mobility as a fundamental need is deeply embedded in people's lives as a habitual behaviour. Habits are actions performed frequently and automatically, without conscious consideration (Buhler, 2020). For instance, an individual who drives their car to pick up the children from school every workday may develop a dependency on cars for these trips. Such habitual behaviours are challenging to change, even when other behaviour, such as sustainable mobility, is a feasible option.

However, habits can be disrupted, particularly life-changing events or systemic regulations that offer key opportunities to influence habitual behaviour (Verplanken & Wood, 2006). During these events, such as moving to a new city, individuals are more likely to reconsider their behaviour which makes them more receptive to information about changing behaviour and alternative sustainable mobility. In the previous example, such an opportunity will appear when the individual moves to another city and the children go to a school with no parking facilities. In this case, the individual may be receptive to considering active mobility instead of the car.

Research shows that a shift in mobility behaviour occurs when one modality gains a clear advantage over another modality. These advantages can vary from costs to reliability (Vedagiri & Arasan, 2009). Looking at the previous example, active mobility that eliminates the need for parking can provide a significant advantage and can prompt a modal shift.

3.2.1 The attachment to cars

Despite the potential and ability for change, many people remain strongly attached to the idea of private car ownership (interview AmsterDOEN). This attachment stems from various factors such as societal norms, emotional value and perception of the car as a status symbol.

Societal norms

The attachment is emphasised by the societal norm that has supported its dominant role in mobility systems (interview Townmaking).

Emotional value

The meaning of cars varies across different societal groups, the car holds significant emotional value and is used by individuals for diverse reasons (Soza-Parra & Cats, 2024; interview Townmaking). Cars are widely viewed as the only mobility that provides the autonomy and flexibility required for life (Freudendal-Pedersen, 2016).

Status symbol

For some individuals, the car represents a status symbol, representing one's financial health and success (interview Townmaking). These perceptions of the car increase the attachment to private car ownership (Soza-Parra & Cats, 2024).

Key take away

The insights that a behaviour shift occurs when one modality gains a clear advantage aligns with the findings from Chapter 2, where research also stated that fractional ownership is only interesting if has a benefit over commercial sharing.

Such attachments to cars and private car ownership impact the intention to select the use of shared cars. An individual's decision to share cars is affected by price, parking convenience and type of car (Paundra et al., 2017). Recognising and addressing these deeply rooted attachments is essential for stimulating a transition towards more sustainable mobility.

3.3 BEHAVIOUR CHANGE THEORIES

This section explores four different behaviour change theories which offer theoretical foundations for understanding how, when and why people change their behaviour. This analysis aims to understand different aspects of behaviour change to develop a human-centred design approach for the broader adoption of MaaC.

3.3.1 Selection of theories

The COM-B model and the S-frame and I-frame theory were selected because of their application in the 'Mobiliteitsradar' research, which makes them relevant and recognisable for the Municipality. The Diffusion of Innovation theory was included to better understand how innovations are adopted, aligning with the SMP's focus on innovation, which contributes to the general understanding of the proposed strategy and adoption profiles of the user groups. The Fogg Behaviour Model was selected as it was a prominent model during the literature review and the application of prompts. The theories are selected based on their application in the mobility transition and the broader adoption of MaaC.

3.3.2 The behaviour change theories

The Diffusion of Innovation Theory

The Diffusion of Innovation theory explains how innovations spread through society (see Figure 16) (Rogers et al., 2008). Rogers has established five categories of adopters: innovators, early adopters, early majority, late majority, and laggards. The theory highlights the importance of overcoming the threshold between early adopters and the early majority for an innovation's success (the orange dotted line in Figure 16). It also includes five attributes that impact the adoption: relative advantage, compatibility, complexity, trialability and observability. For a more detailed theoretical exploration of the theory see to Appendix C.

In the context of MaaC, the theory is a useful tool for understanding how the new mobility concept is adopted. The Municipality needs to identify and target the key adopter groups, the innovators and the early adopters, whose enthusiasm can drive broader adoption of MaaC. The attributes can be used as an advantage to drive adoption. The Municipality already adopts the attribute trialability in their trial by offering trial periods to new initiatives. However, the trial could be enhanced by addressing complexity, which remains a barrier due to the highly complex organisation of MaaC.

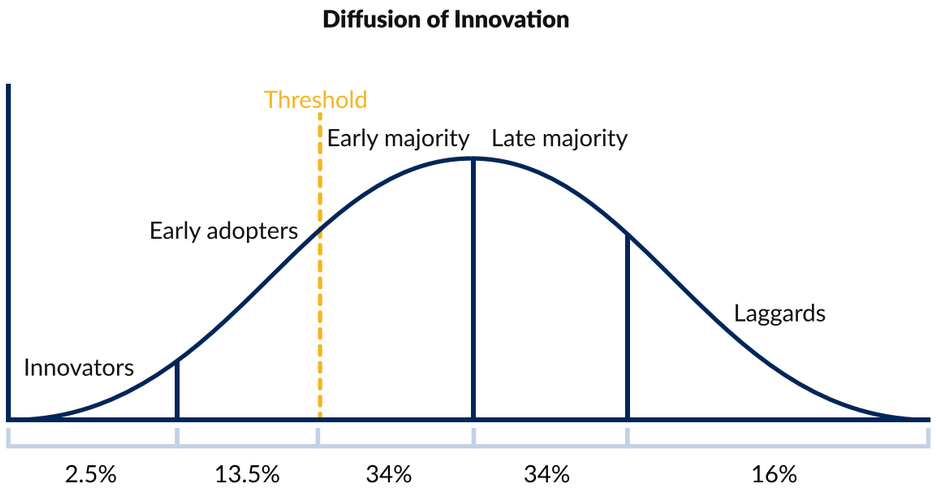


Figure 16 – The bell-curve that represents the diffusion of innovation by Rogers. The percentages are a representation of the deviation in society. Figure created by the author based on data from (Rogers et al., 2008).

The S-frame and I-frame

Behaviour change interventions can be categorised into individual-focused (I-frame) and system-focused (S-frame) (Chater & Loewenstein, 2023). I-frame interventions target individual responsibility and decision-making, such as campaigns promoting the benefits of shared mobility. S-frame interventions focus on systemic changes, such as speed limits to enforce safer driving behaviour. The theory highlights the importance of implementing both individual and systemic approaches for an effective strategy for the adoption of MaaC. For example, promoting shared mobility adoption requires supportive infrastructure for individual personal incentives to be effective. A detailed exploration of the framework is available in Appendix C.

The COM-B Model

The COM-B model (see Figure 17) proposes that the following three components can determine whether a certain behaviour (B) will occur: capability (C), opportunity (O) and motivation (M). The model serves as a tool for identifying barriers for behaviour change and for designing effective behaviour change interventions (Michie et al., 2011; Trend Team, 2024). It seems to suggest that all three factors have an equal importance and effect. However, it depends on the context which factor has more importance than the others. For example, the social norm opportunity may overpower motivation in the mobility transition, as in society private car ownership is still the standard (Trend Team, 2024). A more detailed explanation of the COM-B model is available in Appendix C.

For MaaC, the model helps identify adoption barriers for residents and highlights specific areas of focus for the Municipality. From a municipal point of view, it should be considered what would be the most effective use of methods as it depends on the context (Trend Team, 2024). For example, physical opportunity, such as ensuring the availability of car-sharing infrastructure, is critical during the early phases of the mobility transition.

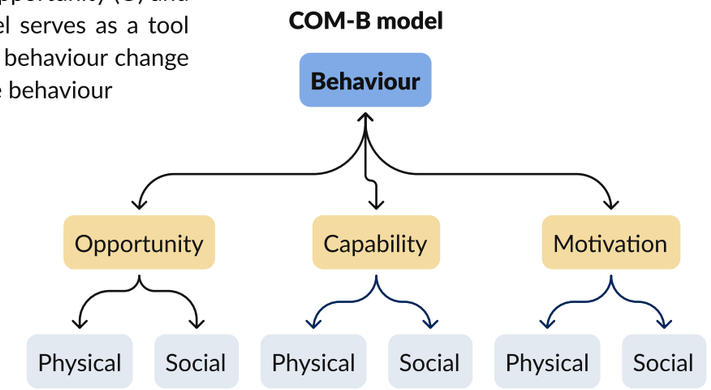


Figure 17 – A schematic overview of the COM-B model which shows the effects of the components on the behaviour. Figure created by the author based on data from (Michie et al., 2011).

The Fogg Behaviour Model

Fogg's Behaviour Model provides insights into behaviour through three drivers: motivation, ability, and prompts, emphasising that even with motivation and ability, a behaviour will only occur if a prompt is delivered (see Figure 18, Fogg, 2009). It highlights the importance of timing; an individual has to be above the activation threshold (orange line) for a prompt to be effective. A more detailed explanation is available in Appendix C.

This model is particularly relevant for designing effective incentives for MaaC adoption. For example, offering designated parking spots as incentives during trials can serve as prompts that encourage residents who are open to shared mobility (motivation) and have a group of neighbours to share with (ability) to try out MaaC.

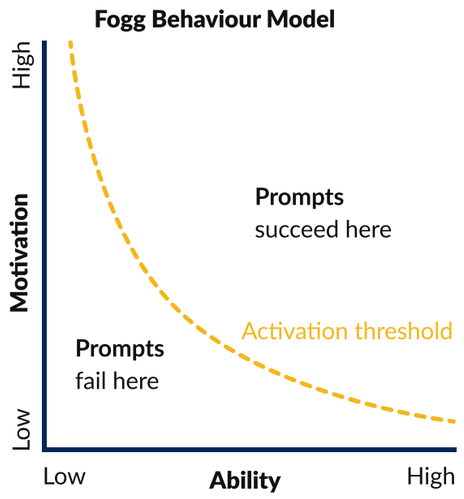


Figure 18 – The Fogg behaviour model. Figure created by the author based on data from (Fogg, 2009).

3.3.3 Comparing the theories

The theories complement each other, while some also share some similarities.

The COM-B model and the Fogg Behaviour Model share similarities; both highlight ability (capability and opportunity) and motivation as key elements for behaviour change. However, while the COM-B model puts more emphasis on the context and identifying the barriers that need to change for behaviour to occur, the Fogg Behaviour Model focuses more on prompts and timing necessary for behaviour change.

The models complement each other. The COM-B model helps identify the broader, underlying barriers preventing the adoption of MaaC. Once these barriers are identified, Roger's attributes can be utilised to lower the barriers. Then the Fogg Behaviour Model can be used to design effective prompts to drive behaviour change. By integrating both models, the Municipality can create interventions to foster the broader adoption of MaaC and support the mobility transition in a dynamic and user-centric way.

The COM-B models show that the barriers vary between systemic and individual barriers, showing that for behaviour change both should be considered and targeted. This aligns with the S-frame and I-frame theory which states that both are needed for effective behaviour change design.

3.3.4 Implementation

By combining the strengths of each of the four theories, an effective human-centred approach for MaaC adoption can be created ensuring behavioural change and thus successful integration of MaaC (see Figure 19).

The Diffusion of Innovation theory helps to identify which groups to focus on at the current state of MaaC. By targeting the innovators and the early adopters with the right interventions, the Municipality can accelerate the shift towards broader adoption. Rogers' attributes can be utilised to design an effective strategy and improve MaaC to drive the adoption.

The COM-B model can be utilised to identify and understand barriers to the adoption of MaaC, such as a lack of infrastructure (opportunity), lack of knowledge (capability), or resistance due to habits (motivation). If these are identified, the Municipality can effectively recognise where to focus on to promote behaviour change and to alter the design of the concept and strategy.

The Fogg Behaviour Model promotes the importance of effective prompts and timing to trigger behaviour change. If barriers to adoption have been addressed, the model can be utilised to design effective prompts.

The S-frame and I-frame show that the strategy for broader adoption of MaaC requires a combination of both individual and systemic interventions.

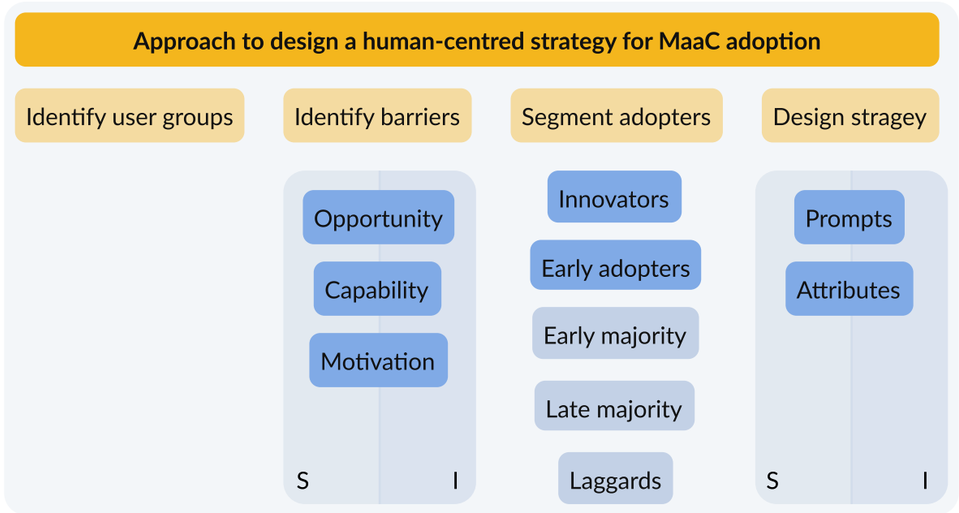


Figure 19 – A schematic overview of the behaviour change theories combined into one method to design an effective human-centred strategy for MaaC adoption.

3.4 CONCLUSION

This chapter aimed to get a deeper understanding of mobility behaviour and how to design for behavioural change. The analysis reveals that the broader adoption of MaaC requires behaviour change through a human-centred strategy that addresses both systemic and individual barriers.

As mobility behaviour is deeply ingrained as a habit, the opportunity for behavioural change lies within life-changing events and systemic disruptions. This aligns with the insights that both systemic and individual interventions are required. Successful strategies and interventions must offer clear advantages over private ownership, while also addressing social, emotional and cultural attachments tied to cars.

The integration of behaviour change theories provides an approach to design an effective human-centred approach for MaaC adoption. By combining the insights from the four theories, the Diffusion of Innovation, the COM-B model, the FBM and the S-frame and I-frame, key user groups, individual and systemic barriers can be identified and addressed and effective prompts can be designed.

It must be acknowledged that this research excludes various other theories on behaviour change which may also contribute to an effective human-centred approach. However, the four selected theories have municipal relevance and provided valuable strengths for the complexity of this project. Future research could explore additional theories on behaviour change to enhance the approach.

Altogether, this chapter provides a comprehensive approach for developing a strategy that encourages mobility behavioural change and broader adoption of MaaC. The approach will be utilised in the next chapter to segment user groups and explore individual and systemic barriers to existing initiatives.

3.5 DESIGN INSIGHTS

The chapter highlighted the following design insights. Besides these design insights, the implementation approach of the theories is utilised to guide the design.

Target life changing events and systemic disruptions

To disrupt habitual behaviour.

Generate incentives to stimulate adoption

Such as reducing parking spaces or offering subsidies for shared transport services.

Ensure MaaC's accessibility and convenience

To create physical opportunity.

Promote benefits of MaaC

To create motivation and to reduce resistance from those with strong attachments to private cars.

Work on infrastructure and policy

To foster physical capability.

Find the key adopter groups

To focus on and to stimulate broader adoption.



Crowded cross road with multiple modalities (Gemeente Amsterdam, n.d.)

4. COOPERATIVE SHARING ANALYSIS

In the previous chapter, behaviour change has been explored and an approach to broader adoption of MaaC has been created to segment user groups and to identify motivation and barriers. In this chapter, various forms of cooperative sharing initiatives are explored to gain a better understanding of MaaC. The aim is to understand the organisation, benefits and challenges of cooperative sharing. The findings provide a better understanding of user needs, motivations, and barriers. Since mobility is not the only aspect that can be shared cooperatively, housing cooperation in Amsterdam was also examined to identify potential insights and lessons that could benefit mobility initiatives.

4.1 RESEARCH APPROACH

4.2 COOPERATIVE SHARING INITIATIVES

4.3 NATIONAAL DEELMOBILITEITSCONGRES

4.4 HOUSING COOPERATION

4.5 CONCLUSION

4.6 DESIGN INSIGHTS

4.1 RESEARCH APPROACH

A combination of desk research and interviews has been applied to conduct the analysis (see Figure 21).



Figure 21 – Icons from representing desk research and interviews.

Semi-structured interviews were conducted with members of initiatives to gain insights into the various aspects of cooperative sharing such as organisation, benefits and challenges and the motivation and barriers of members (see Appendix B for the predefined questions). Eight interviews were conducted with members from seven different initiatives.

Additionally, a shared mobility congress called 'Nationaal Deelmobiliteitscongres '[5] was attended. During the congress, a session was focussed on cooperative sharing where members of initiatives talked about their experiences. Initiatives from The Hague, Soest and Groningen were represented, the board members shared their experiences and answered questions from the audience.

An online seminar hosted by the board members of the housing cooperation 'de Warren' has been reviewed to take insights from another form of cooperative sharing (Hodde, 2020). Only the learnings that are relevant to mobility are described.

To analyse the results the thematic analysis method has been used (see Figure 22). This method helps organise and structure complex qualitative data and puts focus on key findings (Braun & Clarke, 2006). The interviews have been coded to segment the data. These codes have then been grouped into overarching themes and then subdivided into subthemes through an iterative process (Caulfield, 2019).

Thematic analysis

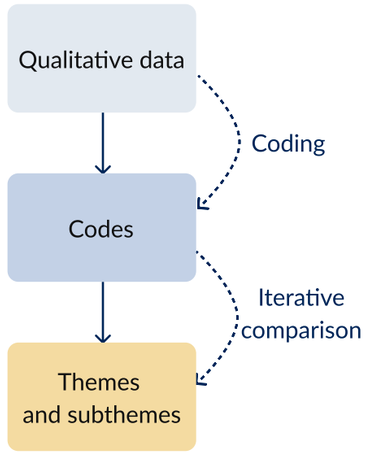


Figure 22 – A schematic overview of the thematic analysis approach. Figure created by the author based on data from (Caulfield, 2019).

[5] The Nationaal Deelmobiliteitscongres is an event, organised by Natuurlijk! Deelmobiliteit. It brings together public and private parties to discuss and collaborate on shared mobility solutions (Home - Nationaal Deelmobiliteitscongres 2024, n.d.). Natuurlijk!Deelmobiliteit is a program organized by thirty public instances at different levels to collectively work on growing and improving shared mobility in the Netherlands (Natuurlijk!Deelmobiliteit, n.d.).

4.2 COOPERATIVE SHARING INITIATIVES

The interviews were conducted with different initiatives spread across different cities in the Netherlands. They provided insights into cooperative sharing in different contexts and different forms of cooperative sharing. See Table 6 for an overview of the interviewee's profiles and contextual information about the initiative.

The initiatives vary in scale, organisation, and structure, yet they are also similar, particularly in members' motivations and barriers. This section provides an analysis of the interviews, highlights the key findings and provides a thematic analysis of five key themes. In Appendix D an overview of the results per initiative can be found for a more detailed overview of each.

Table 6 – An overview of the interviewees and the initatives.

	Interviewee	Initiative	Vehicles
1	New member	The Hague, 2020 50 households	7 electric vehicles, all leased
2	Board member	The Hague, 2020 50 households	7 electric vehicles, all leased
3	Board member	The Hague 2, 2019 95 households	16 electric vehicles, all leased
4	Board member	Amsterdam, 2022 15 households	2 electric vehicles, all leased
5	Board member	Leiden, 2019 15 members	4 electric vehicles, 3 leased, 1 bought
6	Active member	Hilversum 350 households	13 electric vehicles, all leased
7	Board member	MobiGo, 2017 35 neighbourhoods	80 electric vehicles, all leased
8	Board member	Haarlem, 2016 - 2019 125 members	6 electric vehicles, all leased

Key findings

Organisation and roles

The success of MaaC initiatives lies in their community-driven character, bottom-up organisation and the dedication of key members, who are from now on referred to as key Figures. These key Figures are highly motivated, believe in the concept and are willing to dedicate time and energy to the organisation of the initiative.

Starting and organising an initiative requires active participation and a shared sense of responsibility from all members. This fosters trust and mutual respect within the group, creating a cohesive and supportive community. Due to the shared ownership members often view and therefore treat the shared vehicles as their own.

"They are all people who come across as very social, let me put it that way, considerate of each other and ensuring that the cars are clean and left in good condition."
– Interviewee 1

"I really feel like those cars are my cars."
– Interviewee 2

Generally speaking, there are two types of members: those driven by idealistic motivation (the key Figure) and those who approach it more from a consumer-minded perspective (the user). Initiatives depend heavily on member's involvement as these initiatives are not merely service providers and often promote taking on responsibility. In some initiatives, this behaviour is rewarded. Often when members want to be active, they will step forward and take on a more active role. Others take upon the role of the user.

"If we are looking at the adoption curve, we are not at the majority yet."
– Interviewee 8

"More as a citizen or more as a consumer, that's a bit of a difference."
– Interviewee 2

Car dependency

Members expressed that the transition from private ownership to shared mobility requires a decrease in car dependency. To become less car-dependent, access to public transport plays a key role. This connection of shared mobility to public transport was also expressed in the interview with AmsterDOEN (chapter 2).

"The better the public transport, the sooner a shared car can be a replacement for a private car."
– Interviewee 7

"I work and live in the same city, it is almost a requirement. Or you should be able to go to your work by train."
– Interviewee 2

Key take away

In the case of these initiatives, the key Figures can be segmented as the innovators and early adopters from the Diffusion of Innovation theory (chapter 3), which are very important groups to consider designing for as their successful adoption and experience will lead to overcoming the threshold and broadening the adoption of MaaC. Therefore, these findings on their motivations and barriers are key for designing an effective strategy.

The role of the Municipality

Municipalities can play a key role in the development of initiatives. There are multiple things the Municipality can do, such as facilitating policy on cooperative sharing, providing financial support and enabling infrastructure, such as designated parking and charging stations.

"Yes, you definitely need the Municipality."
– Interviewee 2

Expert guidance, very important during the initial stages, does not necessarily have to come directly from municipalities. Collaboration with members from other initiatives or experienced organisations can also facilitate this guidance.

Community engagement

As previously mentioned, the success of MaaC initiatives depends heavily on active community and member participation. Hosting onboarding sessions for new members and bonding events can build trust and familiarity among members, creating a sense of ownership, and commitment.

"We all have to trust each other a little bit"
– Interviewee 1

Key take away

The role of Municipality of facilitating policy aligns with the lack of recognition challenge of Commons (chapter 2). Enabling infrastructure and providing financial support aligns with the findings of the COM-B model in chapter 3, as it creates physical opportunity and financial capability.

Scale

There is a balance in the scale of an initiative. A large scale provides more certainty in availability and financial stability. The downside is the increase of anonymity in the community. In a small initiative members know each other, yet the workload is carried by fewer members and it is more vulnerable to unavailable or damaged cars, which contributes to availability anxiety. Each scale has its benefits and challenges, it depends on the initiatives and their values and what scale they aim for.

"If you grow, you get more cars, there is more flexibility, there is more impact."
– Interviewee 28

"It would be nice to have a little bit more bonding between the members."
– Interviewee 3

Financial

A financial challenge appears to be initial start-up costs. These initiatives received various subsidies from the municipalities for the start-up. These subsidies were crucial in covering key expenses such as down payments for vehicle leases and materials for recruitment, enabling the initiatives to establish themselves. This highlights the need for financial support in fostering MaaC. However, long-term financial stability remains dependent on member participation and effective cost management.

The initiatives demonstrate that the more they do themselves, the lower the costs for members.

Trialability

Introducing a trial period for potential new members has proven to be a powerful tool for recruitment. By allowing potential members to experience the benefits of an initiative without an immediate long-term commitment, trial periods can ease the transition, eliminate concerns, and foster confidence in the initiative. This approach has been proven by initiatives to be successful and encourage individuals to transition from private ownership to shared mobility.

"It is more affordable and sustainable mobility for people , and there are less cars on the streets"
– Interviewee 7

Flexibility

The initiatives show the flexibility potential of cooperative sharing. In some of the initiatives, there are special regulations for some members who have unique needs, such as tailored pricing or fixed booking of vehicles. This flexibility can be used to lower some barriers to adoption such as financial or availability anxiety.

Key take away

The trialability as a key finding aligns with Roger's attribute trialability (chapter 3), a high trialability has a positive impact on the adoption of an innovation thus also of MaaC. The trialability of MaaC should be promoted to stimulate adoption.

Potential beyond cars

Currently, the focus of MaaC is mainly on car sharing. The initiatives show that there is potential to include other modalities such as cargo bikes, adding to the increase of shared vehicles.

More than sharing mobility

The initiatives show that cooperative sharing goes beyond merely sharing mobility. It motivates residents to share other resources, promotes more use of active and public mobility and contributes to social cohesion in a neighbourhood. This contributes to the tranistion towards the sharing economy and increased sustainable behaviour.

"We also have a group chat 'share more', because of car sharing we are also sharing more things"
– Interviewee 7

Key themes and subthemes

The initiatives highlight the potential of cooperative shared mobility. All the insights were collected, coded and themes.

The themes and subthemes are categorised into key elements for success (Figure 23), the benefits (Figure 24) and challenges (Figure 25) for MaaC, and the motivations (Figure 26) and barriers (Figure 27) of members.

The key elements, motivations and barriers are repeated categories in chapter 7 therefore they are orange and the benefits and challenges are blue.

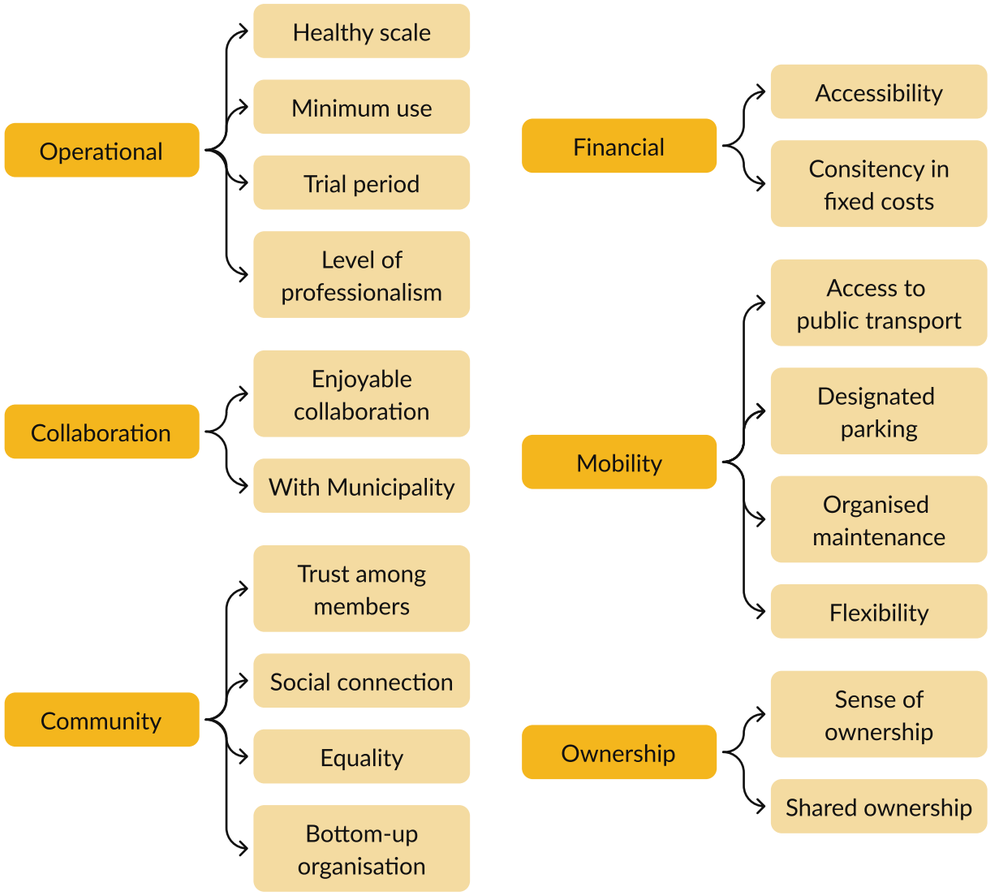


Figure 23 – The key elements for success of MaaC according to the existing initiatives

The key elements of success align closely with the previously highlighted key findings.

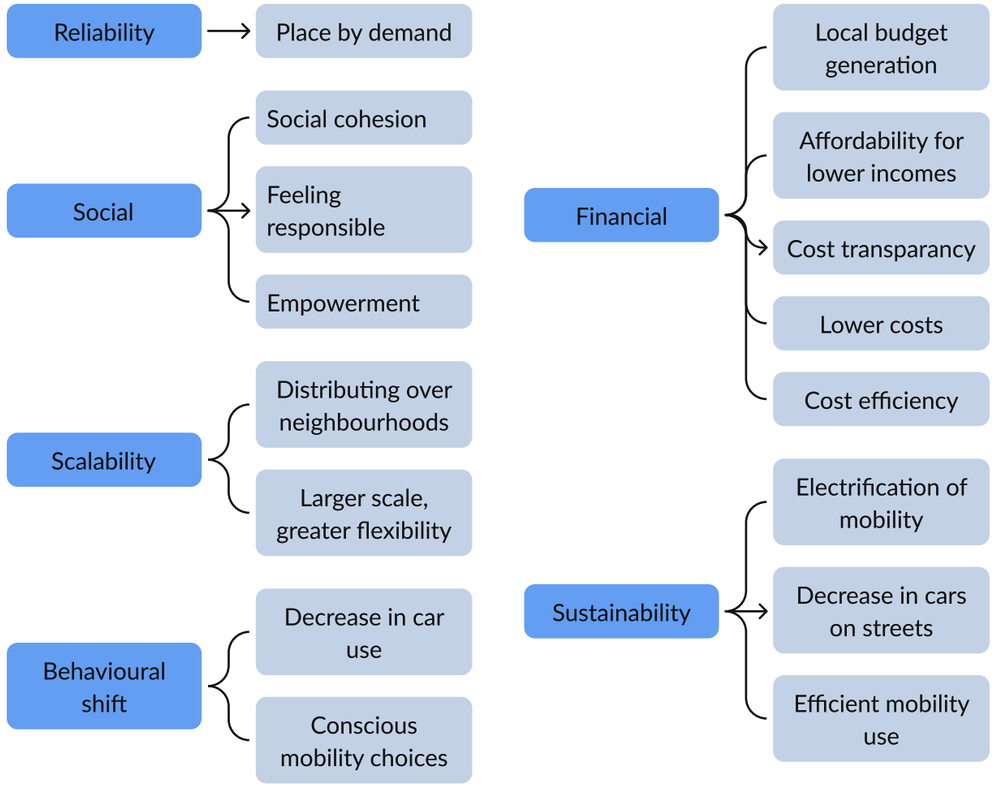


Figure 24 – The key elements for success of MaaC according to the existing initiatives

Challenges of cooperative sharing

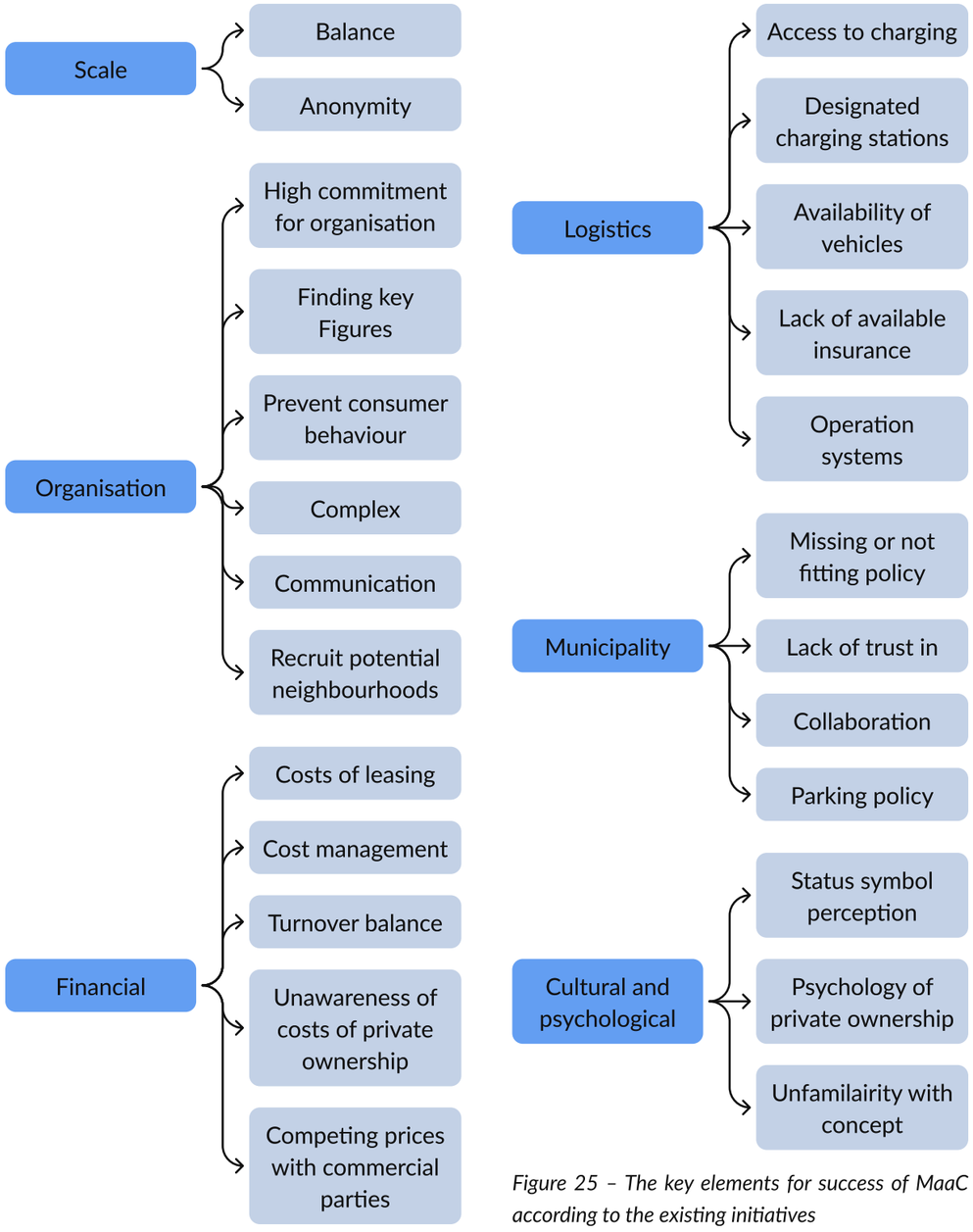


Figure 25 – The key elements for success of MaaC according to the existing initiatives

Motivations for members

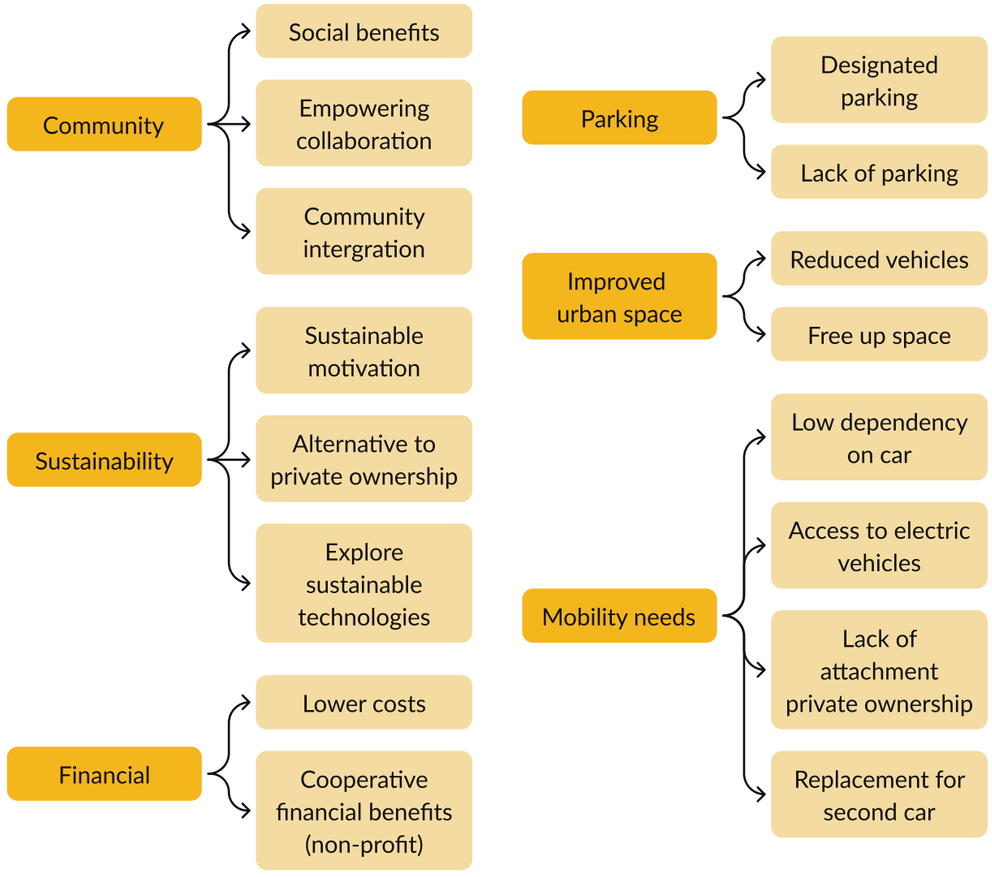


Figure 26 – The key elements for success of MaaC according to the existing initiatives

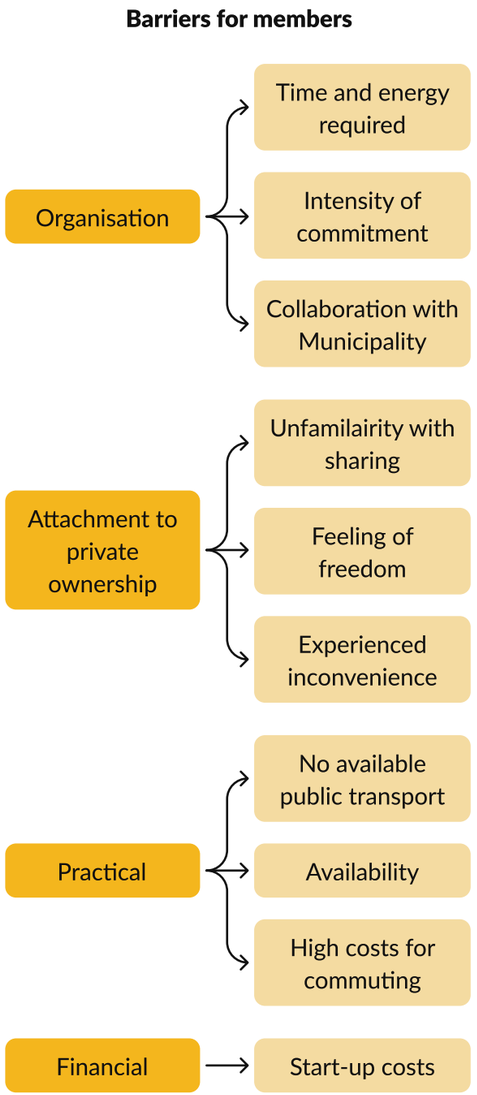


Figure 27 – The key elements for success of MaaC according to the existing initiatives

The benefits indicate that the MaaC indeed holds the potential that is envisioned by the SMP. It contributes to social cohesion and sustainability, has financial advantages and removes cars from the streets. The initiatives show the scalability potential of MaaC, which could contribute greatly to broader adoption and integration (see Chapter 4). Despite the benefits, there are still various challenges that need to be addressed to improve and lower the barriers to adoption.

The interviewed members are pioneers in cooperative sharing and can be segmented as innovators (and early adopters). The insights retrieved from their experience give valuable knowledge on the challenges of MaaC and the barriers to adoption. These provide areas to focus on. Specifically, while these members are not lacking in motivation, several aspects of both capabilities, such as regulations, and opportunities, such as parking facilitation, could be improved to enhance their experience and encourage broader adoption. Their motivation can be used to identify user groups that share these motivations and are key groups to focus on as they can be triggered through prompts, if capability and opportunity allow, into transitioning from private ownership to shared mobility.

These findings provide a valuable overview of insights in key elements, user motivations and barriers that can be utilised to define a design brief and lead the design.

4.3 NATIONAAL DEELMOBILITEITCONGRES

A significant takeaway was the emphasis on keeping these initiatives community-driven and built from the bottom up. Municipalities do play a key role in supporting and facilitating such initiatives, as internal ambassadors can help build support and guide members through processes like licensing. Collaboration is key to success. Expert support during both the foundation and operational phases is highlighted as crucial yet does not necessarily have to come from municipalities.

The importance of having key Figures who are deeply committed to the initiatives was emphasised, as establishing, and maintaining an initiative demands extensive involvement. Cooperative sharing initiatives are not organisations where people can passively consume, they are built on actions and connections within the community. Due to the shared ownership members develop a sense of responsibility for the shared vehicles, treating them as their own.

A trial period is emphasised to be a useful tool to attract and convince potential members, as it allows them to experience cooperative sharing without having to make a long-term commitment.

These bottom-up initiatives demonstrate that community-based sharing can work effectively.

"Sharing in a warm, supportive community."
– Board member

4.4 HOUSING COOPERATION

The Warren is a housing cooperation built in Amsterdam. The project emerged from a desire for a more permanent collaboration within an existing community that already shared many activities and co-owned vacation homes. The core values of The Warren revolve around three pillars: sustainability, affordability, and collectively. These are embedded in the organisation of the cooperation. The Warren chose to develop the project itself without involving external parties with a profit motive. This ensures the cooperation remains true to its values. The Warren positions itself as a living lab, a space where knowledge is shared to inspire and support other motivated individuals.

Establishing a strong collaboration with the Municipality is essential. The Warren aligns with the Municipality's vision goals and they formalised agreements, such as embedding resale restrictions.

Additionally, collaborating with other cooperative sharing projects fosters knowledge exchange. Developing tools like standardised templates and workshops to share expertise contributes to the knowledge exchange and has the potential to lower the barrier for other initiatives.

According to the Warren, a successful initiative relies on active engagement and a keen sense of community. The Warren achieves this through transparent communication, shared living guidelines, and self-development.

4.5 CONCLUSION

This chapter's goal was to gain a better understanding of cooperative sharing by analysing organisational aspects as well as the experience of members. The analysis provided insights into the key elements, benefits, challenges, motivations and barriers of cooperative sharing, which are reflected in the themes provided by the thematic analysis. The benefits and motivations expressed in the interviews align with the envisioned potential of MaaC described in section 2.2.2.

The diversity of the initiatives highlights the potential of the flexible of MaaC, it shows the ability to meet the needs of a wide range of residents. The benefits show what MaaC can offer both residents and municipalities, and the challenges and barriers indicate design areas for improvement and opportunities. Motivation shows what drives the members to be part of the initiative and choose for cooperative sharing. These insights can be used to find residents whose motivations align and can be stimulated through facilitating capability and opportunity to adopt MaaC. It can also be used as inspiration to facilitate motivation with unmotivated residents.

Additionally, the analysis provided insights into the organisation of these initiatives, the potential role of municipalities and what elements are key to success. The findings show that initiatives thrive on community-driven, bottom-up organisations relying on key Figures. Members are motivated by values or benefits, while barriers often stem from a lack of capability and opportunity.

Aspects such as trialability and flexibility appear to successfully impact the adoption of MaaC. The key role that municipalities play is emphasised. Municipalities should take the role of supporters, facilitators and collaborators.

The research also explored how lessons from the non-mobility cooperative sharing The Warren, could inform mobility initiatives such as MaaC. The approach of The Warren demonstrates that collaboration and transparent communication can enhance success. Sharing knowledge and tools with others can reduce barriers to adoption and encourage new initiatives to start.

All in all, the findings are valuable for the design of an effective human-centred strategy for broader adoption as the benefits, challenges, motivations and barriers give valuable knowledge on elements for improvement and designing for diverse adopter segments.

4.6 DESIGN INSIGHTS

The chapter highlighted the following design insights. Besides these design insights, the themes and subthemes are utilised for the design.

Collaborate with key Figures

Key Figures play a key role in the adoption and integration of MaaC as they lead the foundation and organisation of initiatives.

Design for the two types of members

Recognise that there are two types of members: key Figures and users. This opens the opportunity for residents to adopt MaaC who do not want to take on an organisational role, the strategy should consider approaching both types.

Foster collaboration between initiatives for knowledge sharing

Between initiatives to offer expert guidance and knowledge to new initiatives so they do not have to reinvent the wheel.

Define the role of the Municipality

The Municipality should take on the role as facilitator, supporter and collaborator

Facilitate potential in policies for the bottom-up organisation

The initiatives should remain community-driven and bottom-up organised by empowering residents to lead MaaC initiatives.

Organise MaaC information and trial events

Information and trial events should be organised for residents to meet initiatives and/or gain knowledge on MaaC.

Collaborate with initiatives on a trial framework

Trial periods for new members joining an initiative should be offered to experience MaaC with long-term commitment.

Focus on reducing car dependency

Public transport plays a role in the availability anxiety and reduces car dependency.

Consider a financial support plan for starting initiatives

As start-up costs are an important barrier, subsidies considered in a financial support plan could contribute to adoption.

Focus on adressing barriers in capability and opportunity

To stimulate broader adoption

5.

DESIGN BRIEF

The analysis phase has provided insights into the context and potential of MaaC in Amsterdam. It provided an approach to design for behavioural change and highlighted the motivations and barriers for users of MaaC. The first diamond is concluded in a design brief that inspires the design phase of the second diamond. It starts with the problem statement followed by the design vision, goal, and criteria. This design brief provides a framework to design a strategy that drives the broader adoption of MaaC and supports the integration of MaaC into Amsterdam's mobility system.

5.1 PROBLEM STATEMENT

5.2 DESIGN VISION

5.3 DESIGN GOAL

5.4 DESIGN CRITERIA

5.1 PROBLEM STATEMENT

The Municipality of Amsterdam faces challenges related to sustainability and liveability, with private car ownership as a main issue. A mobility transition is necessary to address these challenges and create a more sustainable urban environment. Shared mobility, as an alternative to private car ownership, plays a key role. MaaC, as a shared mobility concept, offers the potential to provide accessible, affordable and community-driven mobility for residents while reducing the need for private ownership. It fosters social cohesion and empowers residents to actively shape their mobility. MaaC reduces cars on the street and thus frees up urban space, which can contribute to greener and more liveable neighbourhoods.

Currently, MaaC faces limited adoption due to unfamiliarity with the concept and its benefits, as well as the organisational complexity and high start-up costs. These barriers limit MaaC's potential to contribute to the mobility transition and hinder its seamless integration into Amsterdam's mobility transition.

5.2 DESIGN VISION

Shared mobility services are seamlessly integrated into a human-centred and sustainable mobility system where public transport, shared mobility services and active mobility collaboratively replace private ownership as the norm. MaaC plays a key role as a cooperative concept that empowers residents to shape their mobility.

5.3 DESIGN GOAL

To design a human-centred strategic roadmap that stimulates the broader adoption and integration of MaaC into Amsterdam's mobility system by addressing residents' needs, motivations and barriers.

The strategic roadmap aims to guide the Municipality of Amsterdam in stimulating a broader adoption of MaaC, which contributes to the integration of affordable, accessible and community-driven shared mobility into Amsterdam's mobility system.

A strategic roadmap is chosen to provide a structured approach that integrates both short- and long-term actions. The analysis phase shows that the mobility transition and behaviour change towards sustainable mobility will take time. Therefore, a long-term vision is essential to set the future aim for MaaC, ensuring its alignment with broader mobility goals. At the same time, short-term actions are necessary to refine the current MaaC concept, address existing barriers, and provide clear steps.

5.4 DESIGN CRITERIA

Four design criteria serve as the foundational principles that guide the design of the strategic roadmap.

Human-centred design

The strategic roadmap must be designed to address the diverse needs, motivations, barriers, and unique contexts of Amsterdam's residents.

Community driven

The strategic roadmap must aim to maintain the community-driven character of MaaC. This fosters social cohesion and empowers resident to take ownership of their mobility by adopting MaaC, which gives them autonomy over their mobility.

Sustainable

The strategic roadmap must aim for a transition towards a more sustainable mobility system in Amsterdam by promoting shared mobility.

Scalable

The strategic roadmap must consider a scalable approach that allows MaaC initiatives to grow and distribute, ensuring they can expand to meet the diverse needs of different neighbourhoods in Amsterdam.



A street with cars parked on both sides. Photograph taken by author.

6.

RESIDENT SEGMENTATION

The goal is to design a human-centred strategy that stimulates broader adoption by residents in Amsterdam. Therefore, user research on residents in Amsterdam will be conducted to design for their needs, motivations and barriers. To conduct research within the scope of this project, two neighbourhoods are selected for the resident research. This chapter defines the two potential resident groups at the neighbourhood level for MaaC through user segmentation within Amsterdam. The aim is to identify resident groups whose mobility challenges align with the potential MaaC offers. In this chapter, the segmentation process is explained and concludes with the two selected neighbourhoods. These two segments are further explored in the next chapter.

6.1 RESEARCH APPROACH

6.2 PREPARE SELECTION

6.3 SELECT NEIGHBOURHOODS

6.4 CONCLUSION

6.1 RESEARCH APPROACH

For this research approach, the method of user segmentation is applied. For the segmentation, two research methods have been used: desk research and observations (see Figure 28).



Figure 28 – Icons representing desk research (left) and observations (right).



Observations

Observations were conducted to gather contextual insights into residents' (mobility) behaviours within the neighbourhoods. This method provided an overall understanding and feeling of the neighbourhood, including mobility aspects (van Boeijen et al., 2013).

The user segmentation method allowed for a targeted approach to understanding diverse groups by breaking down Amsterdam into smaller, more defined groups. The method helps to identify insights specific to those groups (van Boeijen et al., 2013). The Municipality envisions MaaC to be a solution for parking, socio-economic, and accessibility challenges. Based on the challenges selection criteria were defined for the selection on multiple city levels.

User segmentation in this project aims to identify two neighbourhoods which represent groups that fit the two defined segments that align with MaaC's potential.

Selecting two groups was a deliberate decision to ensure the scope of the project remained manageable while allowing for a focused and in-depth analysis of each group. This decision was supported by the fact that the main focus opportunities of MaaC (parking pressure, socio-economic, and accessibility) can be divided into two distinct segments.

As MaaC primarily focuses on facilitating shared vehicle use among residents, the proximity of residents and shared vehicles is an important criterion. According to research, the maximum accepted walking distance to a car is a hundred to two hundred metres (CROW, n.d.). Convenience plays an important role in the success of shared mobility (Machado et al., 2018). Scale also plays a key role in the success of MaaC (see Chapter 4). These criteria indicate that for successful implementation of MaaC, the shared vehicles must be nearby and convenient, and the area should be large enough for scalability. To address all criteria, the scope is narrowed down to neighbourhood-level areas. At this level, residents live near each other and the area is big enough to reach a healthy scale.

Because of Amsterdam's size and to keep it manageable for the scope, the segmentation process started at the district level to identify two suitable districts based on the defined criteria. A similar approach was previously applied in Rotterdam for a graduation project (van Lookeren Campagne, 2024). Following the district selection, observations were used to select specific neighbourhoods.

6.2 PREPARE SELECTION

To conduct the user segmentation with a targeted approach, two segments and selection criteria have been defined that align with the envisioned potential of MaaC (see Figure 29).

6.2.1 Neighbourhood segments

The accessibility and socio-economic challenges are combined in one segment. During the selection of districts, these objectives appeared to often overlap in Amsterdam (see Appendix E for an overview of the selection on the district level). Research by the Knowledge Institute for Mobility Policy (KiM) shows that in less urbanised areas, where lower SES groups often live, the availability of public transport and shared mobility is often limited (Jorritsma et al., 2012, 2021). This supports merging the two challenges into one segment.

Segment 1: Residents who live in an area with high parking pressure.

This group lives in a dense urban area where parking is scarce, which makes it difficult and inconvenient to rely on private car ownership. MaaC could offer a solution to reduce the need for private cars.

Segment 2: Residents with low SES and low mobility access.

This group lives in an area with a low SES, limited access to public transport or shared mobility and high car ownership rates. This group tends to rely on private vehicles due to a lack of alternatives, even though financial constraints make private car ownership challenging. MaaC could offer a more affordable solution to their mobility needs.

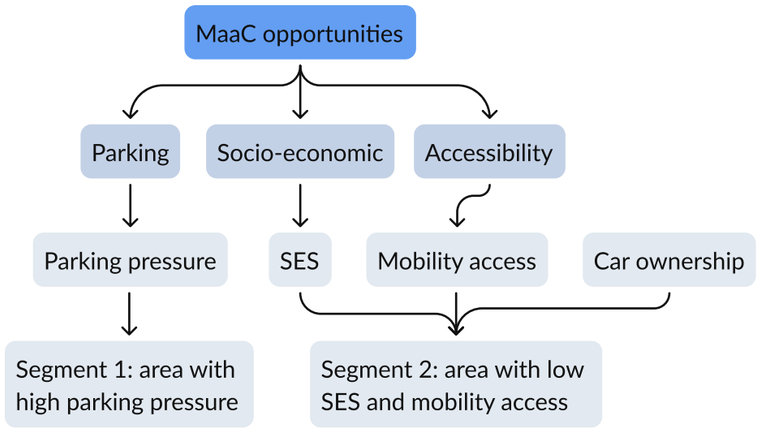


Figure 29 – A schematic overview of the translation of the challenges into selection criteria and the segments.

6.2.2 Selection criteria

Parking pressure

MaaC aims to be a solution to the parking pressure of the city. Areas with a high pressure are interesting to target.

SES

SES refers to the position of individuals or groups within a society based on several economic, social, and educational factors (Statistiek, 2022).

Mobility access

Mobility access gives an insight into the access to different mobility options residents have. This includes public transport, the metro, tram and train network, and shared mobility services. The bus was taken out of the equation as it was distributed over the entire city.

Car ownership

MaaC aims to lower private car ownership so an interesting group to target is one with a high car ownership rate.

To prepare the selection, data for the criteria was gathered from various sources to create a selection overview per district providing insights into the selection criteria (see Appendix E).

The following sources were used for the criteria:
The dashboard for research and statistics provided data on SES and demographics (Dashboard Kerncijfers | Website Onderzoek En Statistiek, 2019).

Data for car ownership from research on car ownership in Amsterdam (Gemeente Amsterdam, 2021c).

The mobility access and parking pressure were retrieved from Maps Amsterdam (Gemeente Amsterdam, n.d.-a). The maps were translated into a measurable scale of high, medium, and low. For mobility access, the information on both shared mobility and public transport was taken together[6]: areas with a lot of shared mobility and public transport were scored high, areas with average shared mobility and public transport were scored medium and areas with a lack of shared mobility and public transport were scored with low. The legends of the maps for parking pressure indicated the scale: red areas were scored high, orange areas with medium and green areas with low. See Appendix E for the maps for analysis.

[6] For this selection, the diversity in shared mobility and the frequency of public transport was not taken into consideration. This does play a role in how access to mobility is experienced. However, as the goal of this selection process was to create an overview of mobility access at a district level the focus on a broader level was enough, as well as including both diversity and frequency would have added complexity without providing significantly improving the selection.

6.3 SELECT NEIGHBOURHOODS

The selection process started at the district level to identify two suitable districts based on the defined criteria. The selection at the district level included all nine districts of Amsterdam (see Figure 31). Then from the district level, the neighbourhoods were selected.

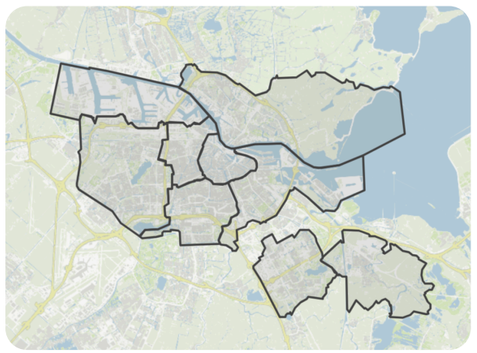


Figure 30 – The map of Amsterdam with the nine districts highlighted (Gemeente Amsterdam, n.d.-a).

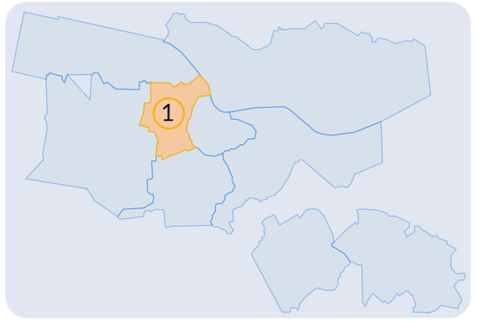


Figure 32 – A schematic overview of the map of Amsterdam, the district West is highlighted in orange. Figure created by the author based on data from (Gemeente Amsterdam, n.d.-a).

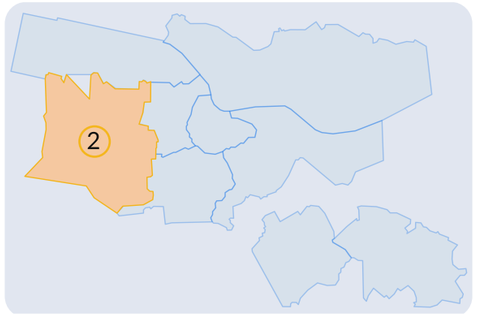


Figure 33 – A schematic overview of the map of Amsterdam, the district Nieuw-West is highlighted in orange. Figure created by the author based on data from (Gemeente Amsterdam, n.d.-a).

6.3.1 Select districts

The selection overview was utilised to select a district for each segment The detailed overview can be found in Appendix E.

For segment 1, the district West was selected (see Figure 32). This district has high parking pressure and a dense urban area. For segment 2, the district Nieuw-West was selected (see Figure 33). This district has one of the lowest SES, high car ownership rates and low mobility access.

Aside from being the best fit for the selection profiles, the selected districts also have the preferences of the MaaC-team as Nieuw-West is already a target district for the GEMINI project so this project could provide valuable insights, and West is a district where more residents live compared to the centre which is filled with tourists.

The other districts were excluded from this research:

- District Oost and Zuid do not score significantly on any of the criteria.
- District Zuid-Oost fits the socio-economic profile yet has a higher mobility access.
- District Noord has higher availability of more shared mobility.
- District Centrum was not selected because the Municipality purposely creates the high parking pressure to aim for a low car city centre.

6.3.2 Select neighbourhoods

The selection criteria were used to narrow down to smaller areas within each district for the selection of neighbourhoods. In Nieuw-West, the Slotermeer-Geuzenveld area was selected based on the low SES score, while in West, the Baarsjes area was chosen due to the high parking pressure. Following this selection, observation in these areas has led to the selection of specific neighbourhoods.

Observations provided valuable contextual insights into the different neighbourhoods in each area. It allowed us to observe residents' mobility behaviours and the overall ambience of the neighbourhood.

As the aim was to conduct user research in these neighbourhoods, it was important to observe whether people were approachable and whether the ambience was comfortable to conduct research. This was taken into account during the selection of neighbourhoods. During observations, the following criteria were considered:

- Parking situation (are there many parked cars, is there any free space)
- Modes of transport
- Approachable residents
- Ambience

In each area, three neighbourhoods were observed. This data was collected and analysed while keeping the criteria in mind (see Figure 34 for an indication).



Figure 34 – An overview of the data collection from the observations in West (left) and Nieuw-West (right).

Segment 1 - Bellamybuurt (West)

In the district West, the neighbourhood Bellamybuurt (see Figure 35) was selected for the narrow streets with cars parked on both sides and limited space for other forms of mobility. The parking pressure is high, and bikes are parked everywhere (see Figure 36). During observations it was noticed that there were many different modes of transport visible in the streets. It is a quiet neighbourhood next to a market and a shopping street which offers opportunities to engage with the residents.

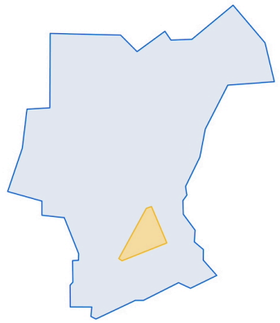


Figure 35 – A schematic overview of district West, the Bellamybuurt is highlighted in orange. Figure created by the author based on data from (Gemeente Amsterdam, n.d.-a).



Figure 36 – A photo taken by author during observations of a narrow street with cars parked on both sides.

Segment 2 - Lodewijk van Deysselbuurt (Nieuw-West)

In the district Nieuw-West, the neighbourhood Lodewijk van Deysselbuurt (see Figure 37) was selected for the sense of community. Central of the neighbourhood there is a community-oriented street with a community kitchen, community shops and shared laundry facilities (see Figure 38). This creates opportunities to approach residents. Besides, it fits well with the community approach of MaaC. The ambience of this neighbourhood positively distinguished it from the other two, which contributed to its selection.

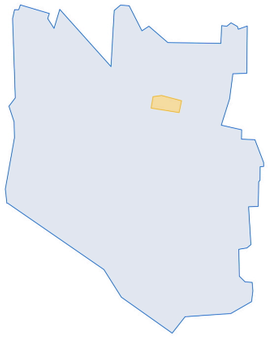


Figure 37 – A schematic overview of district Nieuw -West, the Lodewijk van Deysselbuurt is highlighted in orange. Figure created by the author based on data from (Gemeente Amsterdam, n.d.-a).



Figure 38 – Photos taken by author during observations of two community shops.

6.4 CONCLUSION

The user segmentation identified two neighbourhoods as focus areas for the resident research. The **Bellamybuurt (West)** represents segment 1, an area with high parking pressure. The **Lodewijk van Deysselbuurt (Nieuw-West)** represents segment 2, an area with a low SES and low mobility access.

It is important to acknowledge that several limitations affect user segmentation. The criteria for mobility access were defined by the researcher, combining data and subjective assessment, this affects how the districts scored, and which were chosen. Additionally, the parking pressure did not define what type of parking (residents-, visitors- or work-related) or available spots. This does not give a clear reflection on the impact of resident private car ownership on the parking pressure.

The selection of neighbourhoods was based on both data and subjective assessment, but a more comprehensive and data-driven approach would be beneficial in future studies. The selection of districts is a limiting factor as it ignores comparable neighbourhoods in other districts. A broader selection process at the neighbourhood level from the start could provide further insights into different mobility needs and behaviours across the city.

However, these neighbourhoods present significant opportunities for MaaC to address mobility challenges while aligning with its potential for affordability and accessibility. The research boundaries are not strictly limited to these neighbourhoods, as residents from surrounding neighbourhoods may also participate in MaaC initiatives. This aligns with the scalable potential of MaaC (see Chapters 2 and 4). All in all, the neighbourhoods provide a clear scope for the resident research.

7.

RESIDENT RESEARCH

The previous chapter identified two neighbourhoods for the resident research, the Bellamybuurt (West) and Lodewijk van Deysselbuurt (Nieuw-West). This chapter outlines the research approach for the user research and presents an analysis of each neighbourhood. It provides an insight into each neighbourhood and the key themes in motivations, barriers, and key elements for the adoption of MaaC. These insights are the foundation to ensure a human-centred design approach in the next chapter.

7.1 RESEARCH APPROACH

7.2 PILOT WITH EXPERTS

7.3 INSIGHTS BELLAMYBUURT

7.4 INSIGHTS LODEWIJK VAN DEYSSELBUURT

7.5 CONCLUSION

7.6 DESIGN INSIGHTS

7.1 RESEARCH APPROACH

To better understand residents' needs, motivations, and barriers related to mobility and MaaC, a combination of various research methods has been applied to conduct user research including observations, surveys, and co-creation workshops (see Figure 39).



Figure 39 – Icons representing the range of research methods applied. From left to right: observations, surveys and co-creation workshops.

The research approach is inspired by the theory of generative design research which is based on the four diverse levels of knowledge: explicit, observable, tacit and latent. The combination of the methods of observations (Do), survey (Say) and co-creation workshops (Make) aimed to gain insights into the diverse levels of knowledge (see Figure 40, Stappers & Sanders, 2020).

By integrating all levels, generative research provides deeper insights, enabling more effective and user-centred design solutions. The methods are explained in section 7.1.1. For the analysis of all the findings, the thematic analysis method has been applied to organise and structure complex qualitative data and focus on key findings.

For all communication, both Dutch and English were used in the 'B1-level' to make it as accessible as possible, while also making sure that the researcher was able to understand the communication. So therefore other languages were excluded from the research. The term 'MaaC' was translated into 'Car sharing with a group' to increase language accessibility, this translation is also utilised in the communication of the Municipality towards residents. For the communication materials, the styling of the Municipality of Amsterdam was used to gain trust.

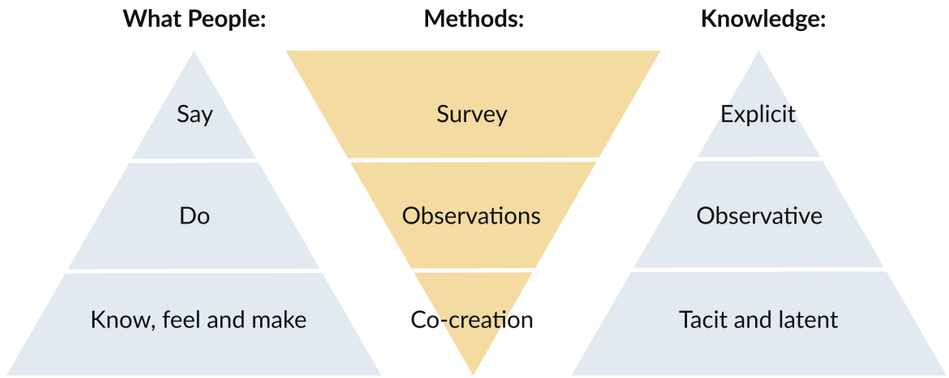


Figure 40 – Visual representation of the generative design research approach, illustrating the four diverse levels of knowledge corresponding what people say, do and make and the methods. Figure created by the author based on data from (Stappers & Sanders, 2020).

7.1.1 Generative design approach

Observations

Observations were conducted to gather contextual insights into residents' (mobility) behaviours within their neighbourhoods. This method provided an overall understanding and feeling of the neighbourhood, including mobility aspects. The observations were conducted at various times and days to observe various residents.

Survey

A survey was conducted to gain quantitative data on residents' knowledge of MaaC, motivations and barriers, and to recruit participants for the follow-up co-creation session (see Appendix F for the survey).

To distribute the survey, flyers with a QR code linked to the survey were handed out in the neighbourhoods and hung in local shops and community centres (see Figure 41). The residents could scan the QR code with their phone and fill in the survey. This approach has been previously applied in a graduation project in Rotterdam (van Lookeren Campagne, 2024). The distribution of flyers was conducted at various times and days to reach a diverse range of residents.

As a response to the initially low response rate, the flyers were also distributed during local meetings and the survey link was shared via platforms like WhatsApp and Instagram.

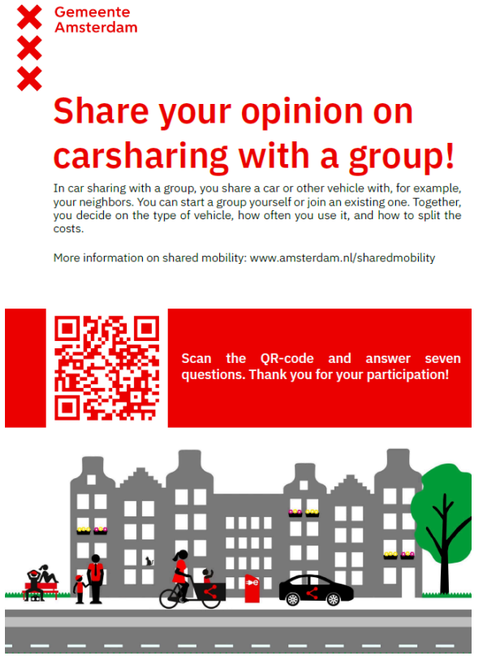


Figure 41 – The flyer used to conduct the survey and recruitment for the co-creation workshop.

Co-creation workshop

This session aimed to use two creative tools to uncover the needs, motivations, and barriers related to mobility and car sharing within a group (see Appendix G).

The first creative activity was combined with the toolkit: Mobility diary (see Figure 42). Participants were asked to fill in this diary two times; one weekday and one weekend day. They were asked to fill in the activities of their day, which mobility they had used and whether they were satisfied with the choice of mobility. The purpose of this activity was to let participants think about their mobility.

and assess their satisfaction, to start the consideration process.

The second creative activity was combined with the toolkit: Design your car sharing group (see Figure 42). Participants were asked to design their car-sharing group with the five key elements: members, vehicles, finances, agreements, and reasons for sharing. The purpose of this activity was to let participants consider their requirements for a group and gain insights into their needs, motivations, and benefits.

After each activity, a brief discussion was initiated to share thoughts and questions.



Figure 42 – The toolkit Mobility diary (left) and the toolkit Design your car sharing group (right)

7.1.2 Approach Lodewijk van Deysselbuurt (Nieuw-West)

The approach for the Lodewijk van Deysselbuurt was tailored to suit the neighbourhood and its residents. During observations, it was learned that the context asked for a different approach. The observations and short conversations with residents revealed that most residents lacked familiarity with shared mobility and an understanding of MaaC. This led to the consideration that a co-creation workshop might not be the most effective method to generate insights. This was supported by the complexity of the concept, the sensitivity of mobility issues noted during the street interviews and interviews with AmsterDOEN, and observations of community dynamics. It was challenging to approach residents appropriately due to the sensitivity of the subject and their focus on other municipal issues. Instead of a co-creation workshop, a few street interviews with residents and one in-depth interview with a community worker[7] were conducted. This section provides an overview of the specific approach for the Lodewijk van Deysselbuurt.

Informal street interviews

Informal street interviews were conducted with residents who were asked about their knowledge and opinions on car sharing with a group. An expert in resident participation assisted during the interviews. The street interviews helped identify initial barriers to engagement with MaaC and provided an understanding of the context.

In-depth interviews

During the street interviews, a community worker from the neighbourhood was met and later contacted for an in-depth interview which was aimed to gather insights into the neighbourhood and discuss car sharing with a group. The toolkit “Design Your Car Sharing Group” was used to guide the discussion.

[7] A community worker is someone who works as a social assistant with vulnerable groups and visits them in their own environment. A community worker tries to improve their social situation by listening, by providing information and advising on social matters. The person can be described as a key individual in the neighbourhood.

7.2 PILOT WITH EXPERTS

A co-creation pilot was conducted with experts from the SMP to assess and refine the workshop before the session with residents of the Bellamybuurt (see Figure 43). A secondary goal was to gather expert insights on MaaC for the development of the strategic roadmap.

The pilot validated the use of the two toolkits and the presentation to visually support the workshop. Feedback on details was utilised to improve the effectiveness of the toolkits.



Figure 43 – Photographs taken by author during the pilot with experts to give an impression of the workshop.

7.2.1 Results of pilot

The session included six participants with expertise in mobility and innovation. Five out of six participants live and work in Amsterdam, providing a dual perspective as both experts and residents. Among the experts, three owned a car, and one shared a car with a friend. This provided a mix of professional knowledge and firsthand experiences, making their insights relevant for integrating MaaC in Amsterdam. The session provided insights into key elements for success (see Figure 44), motivation (see Figure 45) and barriers for experts (see Figure 46).

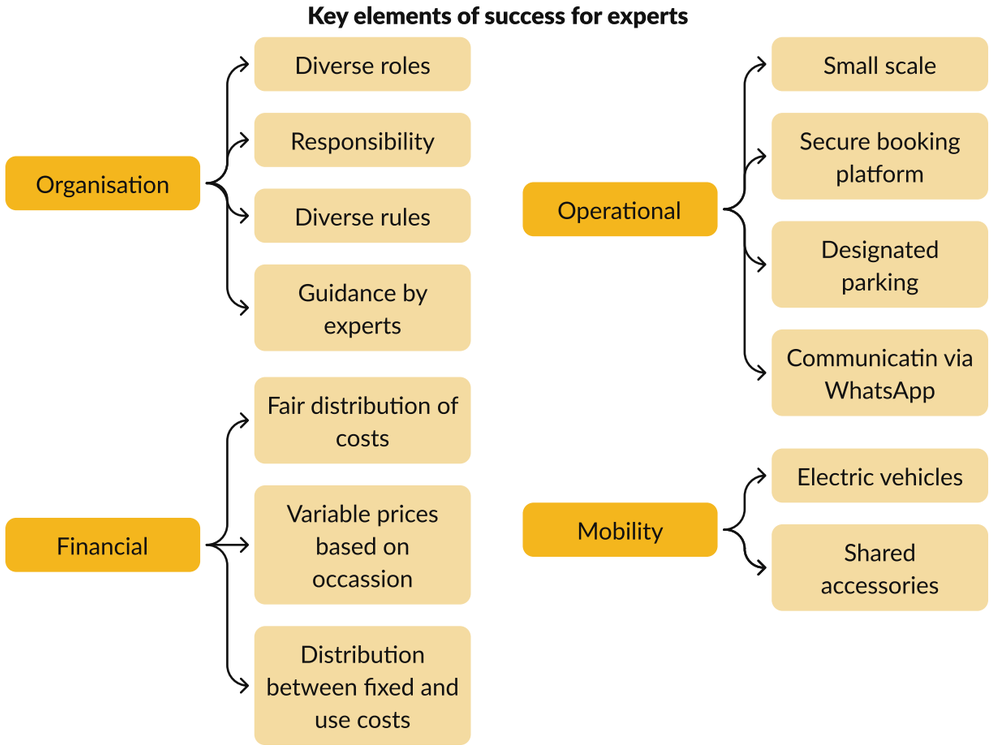


Figure 44 – The key elements for success of MaaC according to experts



Figure 45 – The motivations (top) and barriers (bottom) for experts.

Barrier for experts

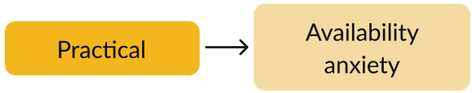


Figure 46 – The barrier for experts.

Sustainability, finances and social cohesion were emphasised as key motivations to adopt MaaC. The access to electric vehicles plays an important role in the consideration to switch from private ownership to MaaC. Despite their enthusiasm, availability anxiey was highlighted as an imporant barrier that would impact their decision to adopt MaaC.

The pilot mostly provided insights into key elements and motivations, as the experts were envisioning the potential of MaaC more than the challenges. Their enthusiasm for the mobility transition may have affected the results.

One important finding from this session is the impact that commuting has on car dependency. Five out of the six experts live and work in Amsterdam, massively decreasing their dependency on a car. On the other hand, the experts living in another city than they work commute by train and not by car. The dependency on a car for commuting decreases when other forms of modalities can also provide transport for commuting.

The findings retrieved from the pilot align a lot with the insights from the initiatives in Chapter 4. The themes of both key elements and benefits are the same, with small distinctions in the subthemes.

This is not entirely surprising, as the experts are mobility innovators and share similar perspectives with the pioneers from the initiatives in Chapter 4. These insights are valuable for the design of the roadmap, as the experts represent an interesting group to target in the initial stages of MaaC.

7.3 INSIGHTS BELLAMYBUURT

The Bellamybuurt represents segment 1, a user group who lives in an area with high parking pressure. A total of seventeen responses to the survey were gathered, with fourteen respondents living in the neighbourhood, and the co-creation workshop was conducted with three residents. An analysis of the findings is provided in this section.

7.3.1 Neighbourhood description

Bellamybuurt is a relatively quiet neighbourhood enclosed between crowded streets. The area consists of mostly four-story apartment buildings with narrow streets with cars parked on both sides. Multiple small green playgrounds can be found throughout the neighbourhood. It was observed that it is a culturally diverse community, which was visible through people on the streets and the produce in the neighbourhood shops and market. See Figure 47 for a visual representation of the neighbourhood.

7.3.2 Mobility in the neighbourhood

A substantial number of parked bicycles was noticed, both in designated bike racks and randomly placed on the sidewalks. This indicates that the bicycle is a widely used modality in this neighbourhood. The residents from the co-creation mainly talked about the use of a car or a bicycle, they did not mention using public transport. It must be noted that due to traffic reconstructions, the availability of public transport is currently limited in the area.

Other forms of mobility and the availability of shared mobility were visible. During observations, multiple shared vehicles were also seen in use. Although a high presence of various modalities, there is limited space for all these modalities which might make moving through the area and parking challenging, mostly for cars.

The neighbourhood offers a garage parking option at the Foodhallen garage, which some residents use when away for extended periods to free a parking spot on the streets. However, parking remains an issue, with high demand during certain times and currently also traffic reconstructions reducing available parking. The parking permit of this neighbourhood covers the smallest zone in the city, adding to the challenge of parking.

The presence of the Ten Kate Markt, Kinkerstraat, and Foodhallen, which surround the neighborhood, attracts many visitors who need transportation to the area, increasing the demand for parking spaces. The pressence of visitors was made clear in short conversations when handing out the flyers, where individuals expressed that they do not live in the neighbourhood.

"Due to the new speed limit of 30 km/u I rather take the bike than the car because I feel pressured by others to drive faster than the limit."
– Woman



Figure 47 - A collage of photos providing an impression of Bellamybuurt. Top left: the narrow streets with parked cars, top right: many parked bikes, bottom left: the many playgrounds and bottom right: a diverse range of mobility forms.

7.3.3 Key themes

The findings of the user research have been collected, coded and themed. For the themes and subthemes of motivations see Figure 48 for motivation and see Figure 49 for the barriers for residents from the Bellamybuurt.

Motivations for residents Bellamybuurt

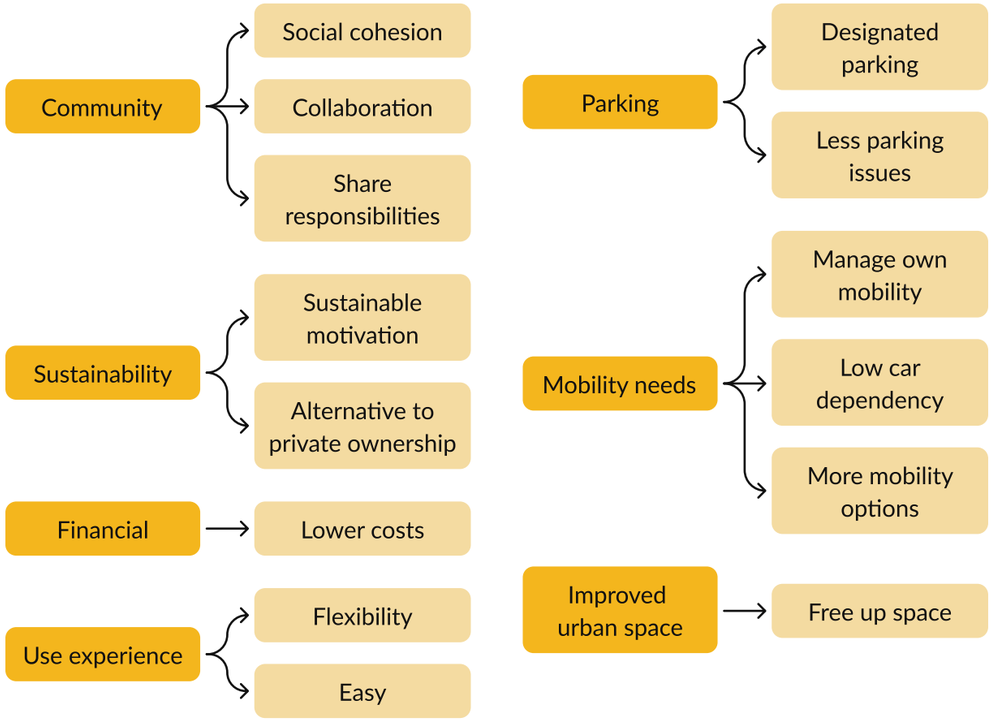


Figure 48 - The motivation for residents in the Bellamybuurt to adopt MaaC ordered in themes and subthemes.

"Car sharing with my neighbours would be a solution for me, because I do not need it very often but I cannot do without a car."
– Woman

"I would want to do it for the community, to work with your neighbours and do something good for the neighbourhood."
– Man

Barriers for residents Bellamybuurt

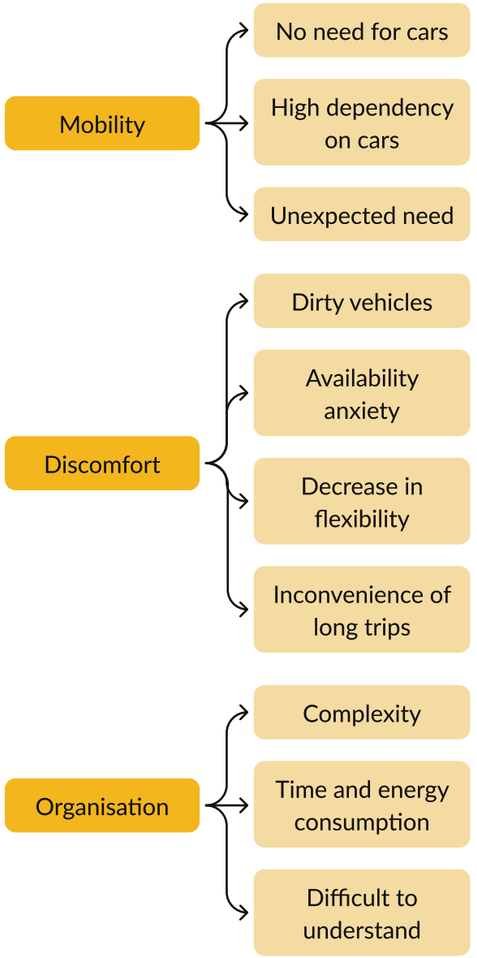


Figure 49 - The barriers for residents in the Bellamybuurt to adopt MaaC ordered in themes and subthemes.

"I think incentives to start sharing would work for me."
– Man

Sustainability, community and parking are key motivators to adopt MaaC. In the session with residents, it appeared that the neighbourhood already has some close-knit groups and that social interaction with neighbours is valued. These groups can be interesting starting points for MaaC initiatives, as the sense of community is already built.

Residents repeatedly emphasised the effect of incentives from the Municipality in encouraging adoption. Positive rewards and recognition could increase the adoption of MaaC.

One important subtheme is the complexity of the organisation and the concept. This has to be taken into consideration during the design, particularly in the development of the policy, the communication tools and the support provided by either the Municipality or other experts.

Additionally, ease of use and potential discomfort were highlighted as important user experience factors that could impact the adoption of MaaC. Addressing these concerns will be key for success.

Key take away

The effect of incentives that is emphasised by the residents aligns with the effect of prompts in Fogg's Behaviour Model. This indicated that the residents might already be above the activation threshold and thus receptive to well-designed prompts.

The motivations and barriers of the Bellamybuurt align with the insights from the initiatives discussed in Chapter 4. This suggests that residents in this neighbourhood may be open to MaaC and take on the role as key figures. These residents appear to fit the ‘early adopters’ group, making them a key focus group in the strategy for broader adoption. Addressing the identified barriers is needed to stimulate the broader adoption of residents in this group who might take on the role of user.

All in all, the research activities in this neighbourhood have provided valuable insights into the motivations and barriers of Amsterdam residents.

7.4 INSIGHTS LODEWIJK VAN DEYSSELBUURT

The Lodewijk van Deysselbuurt represents segment 2, a user group with a low SES and low access to public transport and shared mobility. The survey had eight responses, the street interviews were conducted with eight residents and the in-depth interview was held with a community worker. An analysis of the findings is provided in this section.

7.4.1 Neighbourhood description

The neighbourhood mostly consists of low-built apartments from after the war, which are divided by parking spots and grass fields with playgrounds. Many buildings are in bad condition, which is why there is an entire rebuilding project going on in the neighbourhood. See Figure 50 for a visual representation of the Lodewijk van Deysselbuurt.

In the neighbourhood, there are all kinds of facilities, which require no need for the residents to move to other areas of Amsterdam. The Lodewijk van Deysselstraat offers a variety of community facilities and events for different residents, including coffee moments for the elderly, Dutch lessons, and kickboxing classes.

Many organisations assist residents with various needs. Official communication, such as letters and websites, is often not read thoroughly, or residents struggle to comprehend the content due to language barriers or complexity. As a result, many people require support with reading, translating and understanding.



Figure 50 - A collage overview of the Lodewijk van Deysselbuurt. Top left: The community street with shops. Top right: Various mobility options. Bottom left: Apartments and parking spaces. Bottom right: Local playgrounds.

7.4.2 Mobility in the neighbourhood

Public transport is an important mobility for the residents due to its accessibility, affordability, and lack of biking. The neighbourhood is believed as well connected by tram and bus to various parts of the city or train stations. Public transport is free for children up to twelve and elderly from sixty-five years or older which makes it an affordable option. This contradicts the segmentation of this neighbourhood as an area with low mobility access.

Cars also play an important role in mobility, with two primary types and uses:

- Family cars: large vehicles that are used primarily for vacations. These cars are often deregistered and stored during off-seasons to avoid taxes.
- City cars: small, old vehicles with low insurance and taxes.

Cars are widely used in the neighbourhood, which can be recognised by the crowded parking after seven o'clock in the evening when it becomes free. The streets are also crowded with cars and half-parked cars. The young residents are more materialistic and view mobility as a symbol of status. Other than the young residents, the car is not used for luxury.

There is low availability of shared mobility and bicycles. Sometimes, the resources are not there to buy certain mobility, such as bicycles for children or public transport. Some organisations offer assistance to purchase bicycles to go to school.

7.4.3 Key themes

The findings have been collected, coded and themed. For the themes and subthemes for motivation see Figure 51 and for barriers of adoption see Figure 52 for residents from the Lodewijk van Deysselbuurt.

Motivations for residents Lodewijk van Deysselbuurt

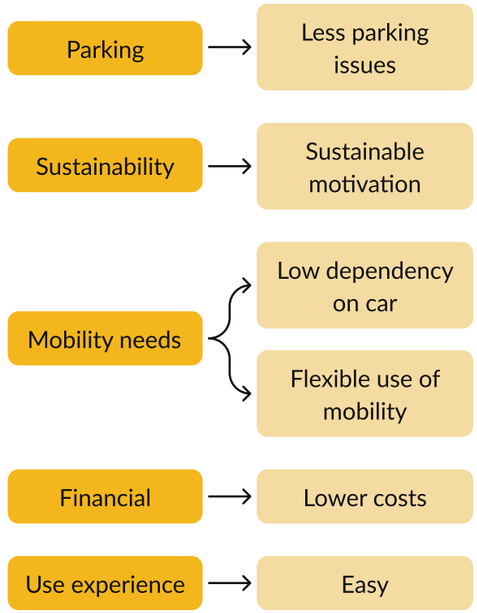


Figure 51 - The motivation for residents in the Lodewijk van Deysselbuurt to adopt MaaC ordered in themes and subthemes.

"My is car is very valuable to me; I wouldn't want to share it. I take good care of it, others won't."
– Man

Barriers for residents Lodewijk van Deysselbuurt



Figure 52 - The barriers for residents in the Lodewijk van Deysselbuurt to adopt MaaC ordered in themes and subthemes.

"This neighbourhood doesn't have the money for this."
– Man

"People here aren't concerned about cars, their concern is about housing or food
– Man

The most significant finding is the role of finances in residents' mobility decisions. The choice of a modality is often driven by its financial advantage over other options. For this neighbourhood financial advantage is the key driver behind behaviour change, presenting a key element to drive the adoption of MaaC in this neighbourhood.

However, despite finance being a strong motivation, the barriers seem to outweigh the motivation in this neighbourhood. Shared mobility is not widely recognised which is a major adoption barrier limiting its potential and, by extension, the adoption of MaaC. Residents are reluctant to share and express a lack of trust in both their neighbours and the Municipality. One important key takeaway is that however hesitant about neighbours, sharing with family is acceptable.

Ease of use is another important factor for residents when considering shared mobility. The community worker expressed that tools could be utilised to enhance ease of use and organisation could play a significant role.

"Of course, I would share with my family, that is different."
– Man

Given the general mistrust in the Municipality, the community worker advises spreading knowledge and building trust from within the neighbourhood. This community-oriented approach can foster empathy and a better understanding, especially since the Municipality's usual communication may not align with residents' preferred styles.

The findings differ significantly to the findings from chapter 4 and the Bellamybuurt. The residents lack general knowledge of shared mobility and are way more reluctant to sharing. This suggest that the neighbourhood might be in another phase of the mobility transition. The focus is primarly on the barriers that associated with sharing mobility, rather than its potential it could offer.

At first, this neighbourhood might not seem like the neighbourhood to focus on for the adoption of MaaC. However, during the in-depth interview, the interviewee expressed that shared mobility does have potential benefits for the Lodewijk van Deysselbuurt, particularly if it addresses affordability. The adoption of MaaC may require more time and a different approach than the Bellamybuurt.

Key take aways

The financial decision making aligns with the insights on mobility behaviour from Chapter 2 and 3 which states that a modal shift appears when one modal gains an advantage over another.

Spreading knowledge from within the neighbourhood aligns with the community-driven and bottom-up character of MaaC which is expressed by the initiatives and the expert AmsterDOEN (chapters 2 and 4).

7.5 CONCLUSION

The chpater reveals that MaaC has the potential to be a desirable mobility option for both neighbourhoods. However, the findings highlight the need for contex and user specific approaches due to different mobility needs, motivations, barriers, current level of knowledge about shared mobility and attitudes to shared mobility. This has been highlighted through both the tailored research approach and the findings.

In the Bellamybuurt (West), high parking pressure is the main mobility concern. Residents have a positive attitude towards shared mobility and are open to exploring MaaC, though complexity and unfamiliarity remain a challenge. Increasing accessibility, and emphasising the benefits of MaaC can encourage adoption.

In the Lodewijk van Deysselbuurt (Nieuw-West), financial constraints, unfamiliarity and lack of trust are key barriers to adoption. While residents are open to the idea of car sharing with family, adoption first requires raising awareness on shared mobility in general. Empowering trusted residents, such as community workers, with the knowledge, support, and tools to educate other residents on shared mobility and its benefits could be an effective first step towards the adoption of both shared mobility and MaaC.

The various needs may require flexibility in how MaaC is designed to meet the needs, or that other forms of shared mobility may fit better for some residents. This insights aligns with the design vision and goal that shared mobility with all its various forms are needed to transition from private to shared mobility.

These findings provide valuable information. However, there are limitations to the research. Altough, the qualitative research provides depth through the co-creation workshop and interviews, the participants may not fully represent all the perspectives in the neighbourhood. Additionally, the tailored approach for each neighbourhood, while necessary, may impact the comparability of results. As the co-creation session focuses more on the latent knowledge of participants, the in-depth interview provided insights into explicit knowledge and may have been biased by the participants as they spoke for other residents.

In conclusion, whereas the Bellamybuurt aligns with the findings from Chapter 4, the Lodewijk van Deysselbuurt seems to be at a different point in the mobility transition and requires a different approach. The following chapter explores how the need for different approaches is taken into account in the design of the strategic roadmap.

7.6 DESIGN INSIGHTS

The insights into the motivations and barriers are used as design insights. The following insights can also be used for the design.

General

Design context-specific approaches

To support the context and resident's needs, motivations, and barriers.

Provide a clear framework that shows how MaaC works

To shows how it works, the benefits it holds and its purpose. It is a tool that offers residents to use of a car over ownership to promote more sustainable mobility.

Design tools to help with MaaC

To improve the ease of use, as this is an important key motivation for residents.

The Bellamybuurt (West)

Promote access to EVs through MaaC

This aligns with the sustainable ambitions of residents.

Look for close-knit groups as starting point

To stimulate the adoption of MaaC as they are already a community.

The Lodewijk van Deysselbuurt (Nieuw-West)

Promote financial benefits of MaaC

To address financial concerns and show finacial advantage over private ownership.

Collaborate with community workers

To educate them on shared mobility to build knowledge and support from within the community.

Organise local information events on shared mobility

To share information to improve understanding of shared mobility and to foster trust.



A street with cars parked on the left side. Photograph taken by author.

8.

DESIGN OF THE ROADMAP

The insights on residents in combination with the insights from the analysis diamond provide comprehensive knowledge to design the strategic roadmap. This chapter outlines the design process of the strategic roadmap that aligns with the design brief and the design insights. The process included the creation of the need-based personas based on the insight retrieved from chapters 4 and 7, followed by establishing the future vision. Multiple ideation sessions have generated input for the design of the strategic roadmap. The design that resulted from this chapter is utilised in the feedback session in chapter 9. The final designs can be found in Chapter 10 - Final proposed design.

8.1 DESIGN APPROACH

8.2 DESIGN INSIGHTS

8.3 NEED BASED PERSONAS

8.4 FUTURE VISION

8.5 IDEATION SESSIONS

8.6 CONCLUSION

8.1 DESIGN APPROACH

The design approach aims to ensure that the strategic roadmap aligns with the design brief, the design insights and the Municipality's vision. It utilises the design insights retrieved from the previous chapters on behaviour change, key elements of success and residents' motivation and barriers. These are translated into design requirements. These in combination with ideation methods and the developed design approach from chapter 3 form the foundation to create an effective human-centred strategic roadmap for integration MaaC. Need-based personas are created that reflect the various needs, motivations and barriers of residents (chapters 4 and 7).

The design approach is built around the principles from Design Roadmapping (Simonse, 2018). It starts by defining a future vision, which sets the long-term goal for the roadmap. From there, the timeline is organised into strategic horizons to help manage both short-term and long-term goals. When the structure is outlined, the roadmap elements are generated through an iterative design process that includes ideation sessions utilising multiple different ideation methods which are highlighted in section 8.6.

Although research showed that both neighbourhoods require a different approach to adopt MaaC, one roadmap is created as both can considered in one strategic plan. The Municipality aims to address the challenges of accessibility and affordability in shared mobility, therefore the insights from the Lodewijk van Deysselbuurt are relevant to take into consideration in the proposed strategy. According to the SMP, these neighbourhoods are often overlooked in shared mobility strategies, therefore it was a wish from the team to include all insights into one strategy.

The Diffusion of Innovation theory is utilised to include the wide variety of needs and attitudes into one roadmap by segmenting the residents groups into adopters segments. It shows the various stages of adoption and which adopters' profile to consider in each phase. The theory shows that adoption is a process and segments follow eachother, supporting to first focus on the highly motivated groups ready for adoption and from there move to the other groups. The adopter segments are reflected by the personas.

8.2 DESIGN REQUIREMENTS

All the design insights from chapters 2,3,4 and 7 have been collected in Appendix H. These have been categorised to utilise and inspire the design of the roadmap. This section presents an overview of the design requirements.



Integration

The roadmap should show how MaaC can be integrated into Amsterdam's mobility system.



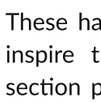
Adoption barriers

The roadmap should focus on addressing the adoption barriers that have been addressed in chapters 4 and 7.



Systemic and individual interventions

The roadmap should focus on both systemic and individual interventions and prompts.



Short and long-term focus

The roadmap should focus on both short-term and long-term activities.

Focus on key Figures

The roadmap should focus on supporting and collaborating with key Figures.



Adopter segments

The roadmap should apply the theory of the adopters segment to show how different resident groups will adopt MaaC.



Logistics and recognition

The roadmap should include elements of improving the logistics and recognition of MaaC, such as parking and policy.



Finances

The roadmap should focus on promoting the financial benefits of MaaC as well as include a plan for financial support.



Reduce car dependency

The roadmap should focus on reducing the dependency on cars.



Promotion

The roadmap should include a plan for the promotion of MaaC and its benefits.



Trialability

The roadmap should include attribute trialability as it has been proven to be an effective aspect of stimulating residents to adopt MaaC.

8.3 NEED BASED PERSONAS

To address the diverse range of mobility needs of residents, six need-based personas were created. Need-based personas focus on shared needs, motivations, and barriers rather than demographics like age or education (KTC Agency, 2023). This approach allows for a deeper understanding of drives users and ensure a need-based focus. Additionally, need-based personas account for a diverse range of individuals as they are not bound to specific demographics (KTC Agency, 2023). For example, residents who align with a specific persona can be found across different neighbourhoods in Amsterdam or other cities. This makes them especially valuable for designing for a broad range of residents reflecting a wide variety of needs. The personas were deducted from the insights in motivations and barriers collected from the initiative's interviews, expert workshops, and user research. The personas were used maintain a human-centred design approach and reflect the adopers segment in each phase[8].

[8] The resident group that strongly resists change are taken out of the scope of this project. Likely, this group will only adopt shared mobility when private ownership becomes almost impossible.

The insights retrieved from the initiatives, experts and research on the Bellamybuurt were combined to create the first five personas. The last persona matches with the research and insights from the Lodewijk van Deysselbuurt. As learned in Chapter 7, the Lodewijk van Deysselbuurt requires a different approach which is summarised into one need-based persona.

The need-based personas represent diverse residents' groups in Amsterdam, distinct roles in MaaC, different adopter groups and represent both residents with and without cars (except for committed car users). The personas have some matching motivations and barriers as not every aspect is unique to one persona. A resident may consider themselves to be a combination of personas.

The sustainable advocate

Key Figure - Innovator

The sustainable advocate is a resident who is enthusiastic about climate action and the potential role of shared mobility. The resident is motivated to reduce the number of cars on the streets. They lack attachment to private ownership; however, they want to maintain ownership over their mobility and have control over it. The sustainable advocate cares about organising for the neighbourhood. However, they bounce heads with missing infrastructure and policies (see Figure 53).



Figure 53 – Visual representation of the sustainable advocate.

The ambitious explorer

Potential key Figure - Early adopter

The ambitious explorer is strongly motivated to embrace sustainable (mobility) solutions. They want access to electric mobility through sharing their mobility. They are focused on finding the most cost-effective options and value access to designated parking. However, they are worried about the complexity of the organisation and the inconvenience of sharing mobility (see Figure 54).



Figure 54 – Visual representation of the ambitious explorer.

The social neighbour

User - Early majority

The social neighbour is community-oriented and enjoys being active in the neighbourhood and contributing to improving liveability. The resident has a low need for a car and would love to transport more sustainably. However, they are a bit hesitant to share due to fear of unavailability and complex services (see Figure 55).



Figure 55 – Visual representation of the social neighbour.

The convenience seeker

User - Early majority

The convenience seeker does not need the car very often and is frustrated by the parked cars in the neighbourhood and the time it takes to find a parking spot. They are seeking ways to save money on mobility and reduce the hassle of private ownership. However, they fear inconveniences experienced due to sharing such as dirty vehicles and unavailability (see Figure 56).



Figure 56 – Visual representation of the convenience seeker.

The commited car user

User - Late majority

The committed car user has a strong attachment to private car ownership and makes frequent use of the car. The residents value the freedom and autonomy provided by a private car. The committed car user is open to sustainable alternatives such as electric cars. However, they fear limited flexibility if they would share their mobility and ease of use is important (see Figure 57).



Figure 57 – Visual representation of the commited car user.

The uninformed, cost aware descision maker

User - Laggards

For this persona, costs are the most important consideration in any decision and saving money is the primary priority. They are unfamiliar with sharing mobility and its benefits, partly due to limited access to information. There is a lack of trust in both the Municipality and its neighbours. The persona fears unexpected costs and misuse by others. Due to other needs and a lack of knowledge, they have little mental space to reconsider their mobility and a low ability or motivation to organise complex services (see Figure 58).



Figure 58 – Visual representation of the uninformed, cost aware decision maker.

8.4 FUTURE VISION

The future vision represents the ultimate goal of the roadmap (Simonse, 2018). The future vision aligns with the research insights, the design brief, and the ambitions of Amsterdam and the SMP.

Future vision for 2050

Amsterdam's sustainable human-centred mobility system ensures all residents have access to shared mobility, replacing private ownership as the norm. Mobility as a Commons is seamlessly integrated providing residents affordable, accessible, and community-driven mobility.

The future vision includes both shared mobility and MaaC, as a form of shared mobility, as tools in Amsterdam's mobility transition. It is important to consider shared mobility in all its various forms as a tool to meet the diverse range of needs of Amsterdam's residents that is reflected by the research in chapter 4 and 7. For a successful mobility transition, shared mobility must become the norm over private ownership, which means that it must be accessible for all residents in ways that fit their needs and contexts. MaaC offers the residents affordability, accessibility, social cohesion, and mobility autonomy, which distinguishes it from other forms of shared mobility. These characteristics can meet the needs of various resident groups that look for these characteristics in their mobility. Therefore, the roadmap focuses on integrating MaaC as a viable shared mobility solution, while also supporting the mobility transition towards shared mobility as a whole in Amsterdam.

8.4.1 Timeline of roadmap

For the structure of the roadmap, the horizontal axis should provide a timeline that indicates the road from the current situation to the future vision, which means the roadmap starts in 2025 working towards 2050.

Therefore multiple points across this timeline have been chosen to explore as the strategic horizons for the roadmap. The main focus of the roadmap is put on the first years because that is when most actions from the Municipality is required. The final horizons are highlighted in chapter 10, section 10.1, as based on ideation and feedback sessions the horizons have been changed to fit the strategic approach.

8.5 IDEATION SESSIONS

To design the elements of the roadmap, the design methods brainwriting, mind mapping, and How-To sessions were used to generate ideas and help inspire creative thinking. For the ideation sessions, the design requirements, need-based personas, the future vision and the timeline were used as the foundation of the roadmap. From the behaviour change theories, Roger's attributes[9] and designing effective prompts have been taken into account.

Brainwriting

The brainwriting method, using blank paper, appeared to be an effective tool to just start writing down thoughts, exploring ideas and making connections. This approach allowed for the free flow of thoughts without any initial constraints, which was extremely helpful with organising thoughts and ideas (van Boeijen et al., 2013).

After the brainwriting method, mind-mapping was utilised to further organise thoughts.

[9] Roger's five attributes that impact the adoption are relative advantage, compatibility, complexity, trialability and observability.

Mind mapping

Mind mapping is a visual tool that starts with a central problem and branches out into related ideas. It helps visualise and organise complex thoughts (van Boeijen et al., 2013).

For the mind mapping sessions, the following topics were put in the centre of the mind map:

- Each need-based persona
- Future vision
- Design goal
- The timeline
- Roger's attributes

The mind-mapping inspired questions that were explored through the use of the How To - method.

How To

The method involves asking a series of "How To..." questions to stimulate creative thinking. It encourages to explore different approaches to solving a problem (van Boeijen et al., 2013). For the questions for the sessions, the design insights and Roger's attributes were used:

- How to make shared mobility more accessible?
- How to make MaaC more accessible?
- How to support residents? (complexity, compatibility)
- How to motivate residents? (trialability, observability)
- How to inform residents? (relative advantage, compatibility, complexity)

Together, these ideation methods resulted in the design of the roadmap elements, ensuring all diverse aspects of the project were taken into consideration.

Throughout the process, multiple design iterations of the roadmap were created. Figure 59 shows a visual representation of these iterations to highlight the iterative process.

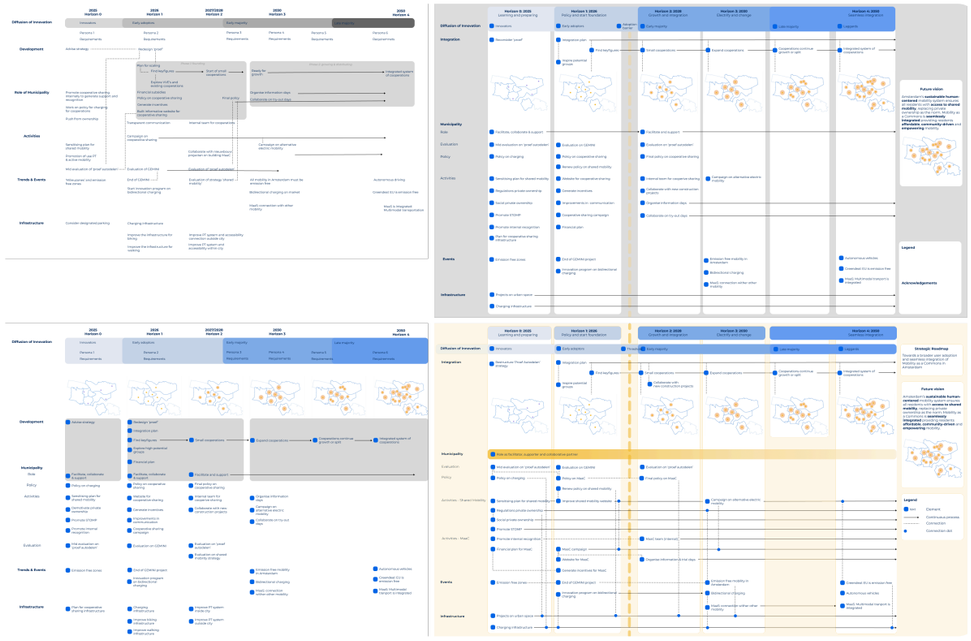


Figure 59 – A visual presentation of the various iterations of the roadmap. The top-left shows the first digital sketch, followed by the next iteration on top-right. The bottom-left shows a further developed version, and the bottom-right shows the version just before the final iteration.

Figure 60 presents the strategic roadmap that has resulted from the iterative design process. This roadmap is utilised in the next chapter to gather feedback and optimise the design. This roadmap is referred to as the strategic roadmap iteration 1. A detailled overview can be found in Appendix I.

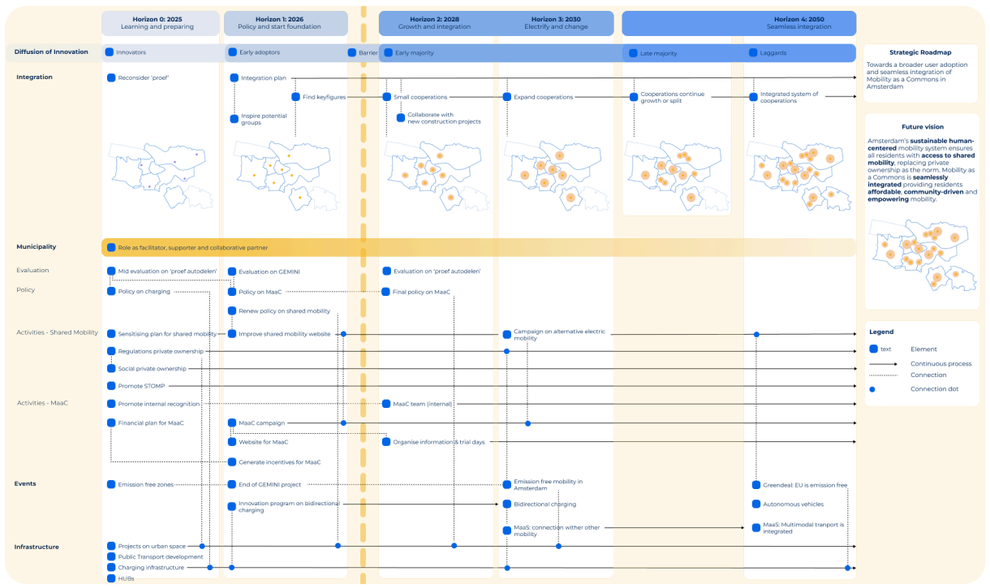


Figure 60 – The strategic roadmap iteration 1 that is designed during the iterative design process.

8.6 CONCLUSION

This chapter outlines the design process of the strategic roadmap. The roadmap's structure was developed by defining the a future vision and corresponding timeline. A human-centred and context-specific approach was ensured by the creation and application of the six need-based personas.

The use of the Diffusion of Innovation theory provided a framework for comprehending the complexity of the broader adoption across different resident segments. Often, segments such as the Lodewijk van Deysselbuurt are overlooked in shared mobility strategies. It was therefore important for the SMP to consider this segment in the project. Applying the theory, the strategic roadmap integrates the various adopter segments through the need based personas. Both early adopters of shared mobility and more hesitant residents groups are considered, demonstrating that MaaC can be successfully implemented in various contexts with diverse resident segments.

Three ideation methods were used to organise and generate ideas for the design of the roadmap elements. The design requirements, the personas, future vision and behavioural change attributes were used to inspire and guide ideation. Through an iterative approach, Strategic roadmap iteration 1 was designed.

The ideation sessions were conducted individually rather than in collaboration with stakeholders, which has to be recognised as a limitation of the design process. Collaborating with stakeholders could have enriched the design by receiving input from diverse perspectives and generating more ideas. To address this limitation, several iteration stepts were discussed with the MaaC-team to receive direct feedback on the ideas.

To conclude, the design process has resulted in a strategic roadmap that addresses the design requirements, future vision and need-based personas. The final strategic roadmap will be evaluated and refined in the next chapter through feedback sessions.



A street where no parked cars are allowed and many parked bicycles. Photograph taken by author.

9.

OPTIMISE THE DESIGN

This chapter aims to optimise the strategic roadmap designed in the previous chapter and continue the iterative design process. To optimise the design and evaluate the proposed strategy, feedback sessions were conducted with multiple experts and the academic supervisory team. The aim was to gather feedback on the strategic roadmap and evaluate and validate decisions. Based on the feedback the roadmap is redesigned, the final roadmap is proposed in the next chapter.

9.1 OPTIMISATION APPROACH

9.2 EXPERT FEEDBACK

9.3 SUPERVISOR FEEDBACK

9.4 CONCLUSION

9.1 OPTIMISATION APPROACH

For the optimisation, feedback sessions were conducted with experts and the academic supervisory team of this graduation project (see Figure 61).



Figure 61 – Icon representing the method feedback session.



Feedback session

Feedback sessions were conducted to gather constructive feedback from different prespectives to highlight areas that may require improvement and to validate design decisions.

The approach consisted of two phases (see Figure 62). First individual feedback sessions with experts were conducted, then the strategic roadmap was redesigned based on the feedback. Secondly, a feedback session with the academic supervisory team was conducted. After which, the strategic roadmap was further redesigned. This iterative process let to the final proposed design presented in chapter 10.

Prior to each session, the participants were provided with preparation materials, including the strategic roadmap, the design brief and the need-based personas. Each session started with a brief introduction to the goal and approach of the session. After which the strategic roadmap was shown and the future vision, horizons and horizontal categories were explained. The participants were first asked to share their initial impressions of the roadmap. Secondly, a series of general and specific questions were used to gather detailed feedback. As each expert and supervisor has its own expertise, the specific questions were tailored to ensure their expertise was used to generate relevant feedback.

The received feedback was categorized to provide a clear overview. The feedback can be distinguished between validation of the design decisions and suggestions for iterations. In case of suggestion for iteration, design actions taken in response to feedback were documented to show how feedback was utilised.

Optimisation approach

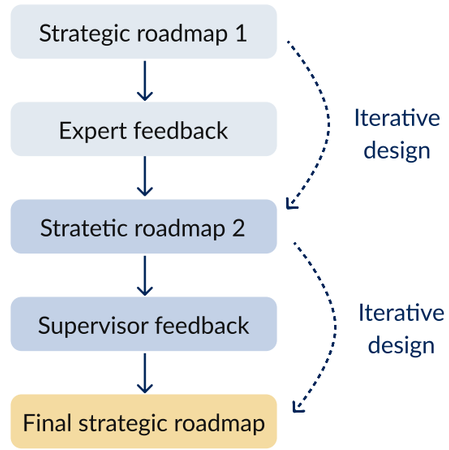


Figure 62 – An schematic overview of the optimisation approach.

9.2 EXPERT FEEDBACK

Three experts participated in the feedback sessions, each brought their own expertise and perspective. The experts had already been interviewed earlier in the research process (chapter 3 and 4). This enabled the sessions to maintain a clear focus on collecting feedback rather than introducing the graduation project and MaaC.

Expert 1
A member of the Trend Team, an expert on innovation and mobility who recently conducted extensive research on behavioural change and its application to the mobility transition. This session focussed on validating the use of the Diffusion of Innovation theory and the character of the elements designed for behavioural change.

Expert 2
A board member of a MaaC initiatives from The Hague. This MaaC expert guides and supports other MaaC initiatives in their development. This session was focussed on the validation of the integration plan and the role of the Municipality.

Expert 3
A former board member of an initiative in Haarlem that unfortunately no longer exists. This expert currently conducts a research for Natuurlijk!Deelmobilieit to address the diverse forms of shared mobility and works on an advisory framework to navigate the challenges they bring. This session was focussed on the future vision, proposed activities, and role of the Municipality.

The strategic roadmap evaluated during these sessions is referenced to as strategic roadmap iteration 1, see Figure 63 for an indication of the roadmap design. In Appendix I the strategic roadmap can be found for a detailed overview.

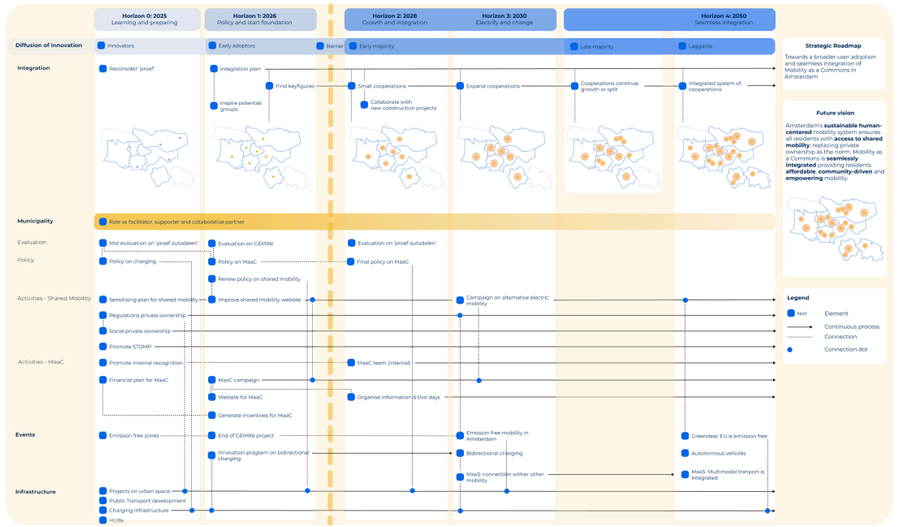


Figure 63 – The strategic roadmap iteration 1 evaluated in the feedback sessions with experts.

9.2.1 The feedback

Overall, the experts were enthusiastic about the strategic roadmap. They emphasised the value of the proposed strategy and the future vision.

"Very nice that you created this. Often, within the Municipality, we develop visions without including a concrete plan. So, it's great that you added this—it provides a clear picture of the expectations."
– Expert 1

"I think it's well put together."
– Expert 3

Future vision

The experts agree with the direction of the proposed future vision. It is emphasised that MaaC indeed is not for everyone and does not have to be. Shared mobility should be deployed in a range of various forms, of which MaaC is one, to suit the diverse needs of residents.

"It is important to view shared mobility as a whole"
– Expert 3

Diffusion of innovation theory

The Diffusion of Innovation theory was validated as an appropriate framework to use, as it provides an understanding of resident behaviour in a complex context. The theory provides a clear indication on residents profiles that should be considered in each adoption phase. Expert 1 emphasizes the decision for this theory as it is a widely known theory which asks for a low need of explanation, which combines perfectly with the complexity of MaaC.

Integration plan

The strategy for integration is well received. The importance of identifying, supporting and facilitating high-potential groups and key figures, such as those already participating in the pilot, is emphasised.

Design action

Instead of inspire potential groups the element is translated into finding potential groups to emphasise the key role these groups play in the adoption of MaaC and align with finding key Figures (see Figure 64).

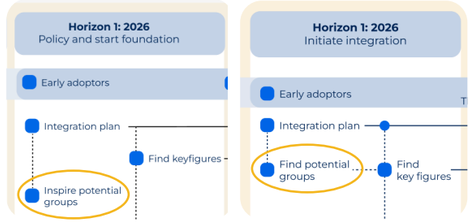


Figure 64 – Change based on the feedback, left is the old design and right is the new design.

Finding the key Figures is a key step for the integration. However, this is a complex process. It is essential that these individuals receive guidance throughout the process and are not overwhelmed with all the information at once. This guidance does not necessarily have to come solely from the Municipality. It is is important not to limit the learning to just within the city, but to learn from other cities as well. This applies to both initiative and municipal level.

"Key Figures are essential for driving adoption."
– Expert 1

Horizons

The timeline of the horizons aligns well with the significance of 2030 as a key transition milestone. By 2025, the ongoing pilot, the ‘Nationaal Deelmobiliteit’ research, and this graduation project should provide valuable insights for further development and to be ready for integration.

MaaC must be stable and consistent before widely rolling it out, as inconsistency and teething problems could result in negative experiences, which are hard to reverse and will dissimulate adoption.

Role of the Municipality

The experts appreciated the proposed role of the Municipality. They mentioned that the level of involvement of the Municipality will decrease over time. At the start, action from the Municipality is necessary. Expert 1 suggested adding the role of ‘driver’ to actively promote shared mobility and low car regulations, as purely the role of supporter might get the concept of the ground.

"The role aligns with what MaaC requires."
– Expert 2

"The role is very good, and I’m glad collaboration is included. Collaboration demands more attention at the start."
– Expert 3

The experts also highlighted a cultural difference between residents and civil servants, particularly in their pace of work. The importance of municipalities acknowledging the capacity of volunteers involved in MaaC initiatives was stressed. If municipalities expect contributions from these initiatives, they must also be willing to actively participate. This mutual engagement reinforces the importance of the term "collaboration" in achieving success.

Policy

For municipal policy and support to be justified, MaaC initiatives must demonstrate their impact. Clear indicators should be established to measure how MaaC addresses specific urban challenges. Internal recognition within the Municipality is also essential to ensure alignment with broader policy goals.

Campaign on alternative electric mobility

This should be launched earlier than 2030 so residents are aware of what to do when the emission free regulations are installed. It is better to act sooner than later.

Design action

The element Campaign on alternative electric mobility has been moved from the horizon 2030 to horizon 2028 to sooner start with the informing residents and providing capability.

Financial support

Financial support for initiatives is key, especially at the beginning. It contributes to overcoming the financial barriers to adoption. Subsidies can play a key role, but clear guidelines are needed to determine when a group is eligible and when they are not.

MaaC campaign

Raising awareness on this form of sharing and making it visible is essential. The Municipality can support by organizing information sessions and assist in spreading awareness about the concept and existing initiatives. It is important to distinguish MaaC as a form of sharing and sharing information about initiatives.

Information and trial days

Organizing these events is beneficial and can often be done in collaboration with existing events that residents already attend.

“Sharing information only helps if people are already interested.”
– Expert 2

MaaS

Experts unanimously recommended removing MaaS from the roadmap due to its complexity and uncertain future.

Design action

MaaS is taken out of the roadmap to take the focus from the difficulties of MaaS and put more emphasis on MaaC, as this is already a complex strategy without the addition of MaaS.

“I would take MaaS out of the roadmap, there is too much hassle and uncertainty about what will happen with it.”
– Expert 2

HUBs

Expert 1 noticed that HUBs was not included in the roadmap and emphasised that it is important to include. HUBs could potentially have an impact on MaaC. By learning from existing mobility hubs to tailor designs to diverse community needs, hubs hold the potential to expand to neighbourhood-specific MaaC hubs or inclusion.

Design action

HUBs is added as an element in the roadmap as part of the theme infrastructure (see Figure 65).

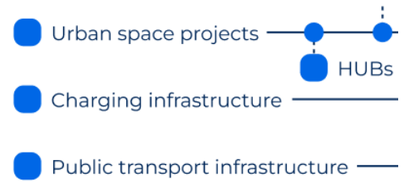


Figure 65 – Change based on the feedback, the addition of Hubs.

9.3 SUPERVISOR FEEDBACK

After incorporating the expert feedback, the redesigned roadmap was presented to the academic supervisory team to evaluate the proposed design and receive feedback from both a strategic and a human centred design expertise.

The strategic roadmap evaluated during these referenced to as strategic roadmap iteration 2, see Figure 66 for an indication of the roadmap design. In Appendix J the strategic roadmap can be found for a detailed overview.

9.3.1 The feedback

The overall first reaction highlighted that, altough the roadmap includes many elements, it remains very structured and clear.

"It is both structured and a lot"
– Supervisory team

Hierarchy

Consider the 3-30-300-second rule to enhance the visual impact, ensuring people can quickly recognize mobility, Amsterdam, and MaaC as the topic of the roadmap.

Design action

The title of the roadmap is enlarged to put focus on this as it immediately translates the main goal of the roadmap to the reader.

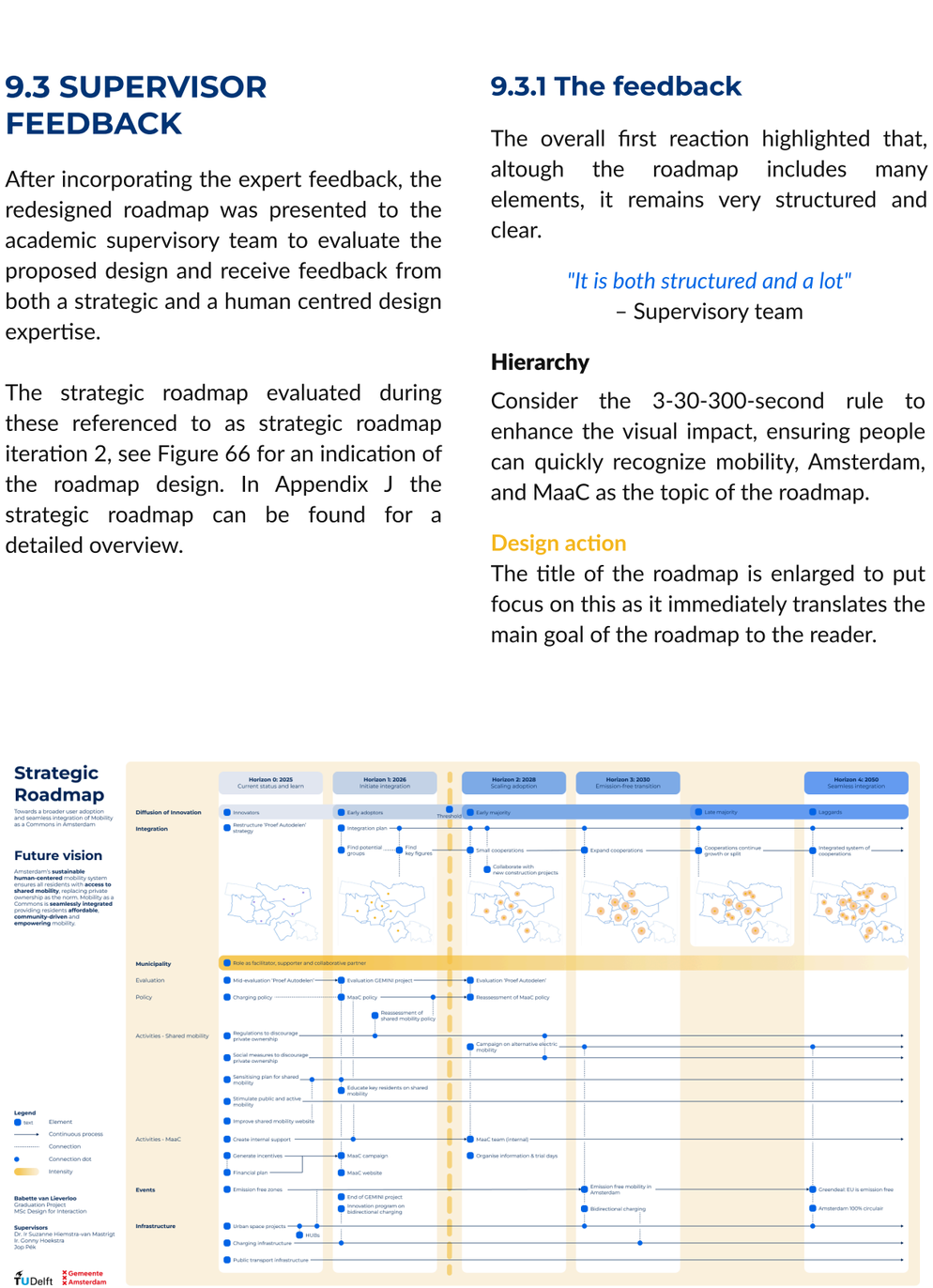


Figure 66 – The strategic roadmap iteration 2 evaluated in the feedback sessions with the academic supervisory team.

Structure

During the session it was emphasised that the relatively empty bottom right corner does not add much value. It was suggested to restructure the horizons and shift the focus on the earlier horizons.

Design action

Horizon 4 2050 has been replaced by the future vision as it is the end point of the roadmap which is the vision (see Figure 67). Instead, the transition phase 2030 – 2050 has been added to emphasise that between 2030 and 2050 the transition is taking place. During the phase the last two personas are adopting MaaC and MaaC will be spread over Amsterdam. This part of the roadmap now adds more value to the strategy.



Figure 67 – Change based on the feedback, left is the old design and right is the new design.

Infrastructure

Public transport is a requirement for the strategic roadmap to be successful, it is not necessarily needed on the roadmap itself. Requirements such as public transport can be described as additional information next to the roadmap.

Design action

The element of public transport has been taken out of the roadmap and added as a requirement in the report.

Need-based personas

Showing theb adopter groups of the innovation theory makes the roadmap more general, while applying personas makes it more applicable to the Municipality, MaaC, and this graduation project. It is recommended to include the personas in the roadmap.

Design action

The adopter groups have been replaced by the personas in the roadmap (see Figure 68). As the experts emphasised the value of the theory in the roadmap, the personas kept the same colouring as the innovation theory to indicate the adopters group and a legenda of the colours has been added in the roadmap.



Figure 68 – Change of adopters to personas, top is the old design and bottom is the new design. On the left the addition of the theory legenda is shown.

Evaluation

MaaC needs to be consistently evaluated to monitor progress and enhance development. This was currently not visible in the roadmap.

Design action

The continues process of assessment and development has been added in the roadmap to indicate that after 2028 it will continue to develop and improve (see Figure 69).

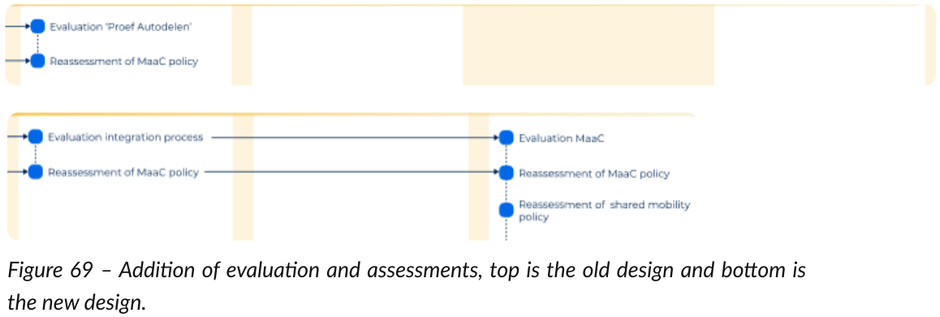


Figure 69 – Addition of evaluation and assessments, top is the old design and bottom is the new design.

9.4 CONCLUSION

The optimisation process of the strategic roadmap was centered on gathering expert and supervisory feedback to validate decisions and refine the proposed design for viability, feasibility, and desirability. Through iterative design, the feedback sessions facilitated improvements in the roadmap's content, structure and design, ensuring it aligns with Amsterdam's mobility transition, MaaC and Amsterdam residents.

Experts confirmed the roadmap's alignment with the broader goals of shared mobility, validated the use of Diffusion of Innovation theory. The importance of clear policies, financial support, and enhanced infrastructure as foundational elements for MaaC's success were emphasised. The focus on high-potential groups and key Figures in the adoption process was highlighted as essential for broader adoption.

Despite the valuable insights, the experts were already previously involved in this project in one way or another. This may have affected their objectivity as they had background information on the project and activities, while also recognising that their input was utilized to design the roadmap. It might have been valuable to perform feedback session with experts who had not yet been involved in the project to avoid prejudice and even conflict of interest.

Feedback from the academic supervisory team refined the roadmap's structure, focusing attention on its key elements. The replacement of the adopter groups with the need based personas personalized the roadmap, making it more relevant to the specific context of this graduation project, mobility and Amsterdam.

Overall, the optimization process addressed the aims of gathering expert insights, validating design decisions, and improving the roadmap's effectiveness. The process has resulted in a roadmap that is more structured and tailored to the needs of stakeholders and the context of Amsterdam's mobility transition. The next chapter presents the final proposed design of the roadmap, incorporating all the feedback received during these sessions.

10.

THE PROPOSED DESIGN

This chapter presents the final proposed design including two roadmaps, a visual roadmap and a strategic roadmap, which is based on the previous analysis design and optimisation insights and activities. Firstly, the roadmaps are introduced and presented. The strategic roadmap provides a detailed strategy with roadmap elements per horizon for implementation. The roadmap shows the current situation, what the end goal is and how to get there. It serves as a tool to guide the Municipality towards the future vision. The strategic roadmap is followed by the roadmap elements and additions to the roadmap. The chapter concludes with the implementation of the roadmaps. The conclusion and discussion on the project and roadmaps are provided in the next chapter.

10.1 STRATEGIC HORIZONS

10.2 VISUAL AND STRATEGIC ROADMAP

10.3 ROADMAP ELEMENTS

10.4 ADDITIONS TO THE ROADMAP

10.5 IMPLEMENTATION

10.1 STRATEGIC HORIZONS

The roadmap is structured into four distinct horizons, each representing a specific phase of the strategy. The horizons provide a structured framework to outline the elements across a timeline of short-term and long-term processes (Simonse, 2018). The horizons were selected based on desk research and expert input, to analyse and prioritise relevant events that guide the timeline. The roadmap is focused on two key milestones: Amsterdam's transition to emissions-free mobility in 2030 and the full integration of MaaC by 2050. MaaC is a relatively new concept in Amsterdam and a bottom-up initiative, therefore the main activities for the Municipality are required in the first two horizons. As initiatives become more self-reliant the required involvement of the Municipality is expected to decrease.

Horizon 0 - 2025: Current status and learn

This horizon is the current status, it focuses on learning from the MaaC trial. The aim is to immediately implement these learnings and prepare the integration plan. This horizon will be dedicated to refining the concept and policy framework to ensure improved resident experience and overcoming perceived barriers. Continue learning, and collaborating closely with residents to identify what is needed to create stable and healthy initiatives.

Horizon 1 - 2026: Initiate integration

Horizon 1 focuses on initiating the integration plan alongside key supporting activities. During this phase, it is essential to enhance the accessibility of all elements for potential key figures, helping them overcome barriers and ensuring an improved experience.

A key milestone in this horizon is the end of the GEMINI project, which presents a valuable opportunity to gather insights, refine policies, and strengthen the strategic framework. Utilising this will ensure MaaC is well-prepared for the next phases.

Horizon 2 - 2028: Scaling adoption

By 2028, the goal is to transition MaaC from the early adopter phase to the early majority, promoting its widespread use and fostering growth. From this horizon, the Municipality's role should become more passive as the initiatives become more self-reliant and the MaaC policy stands.

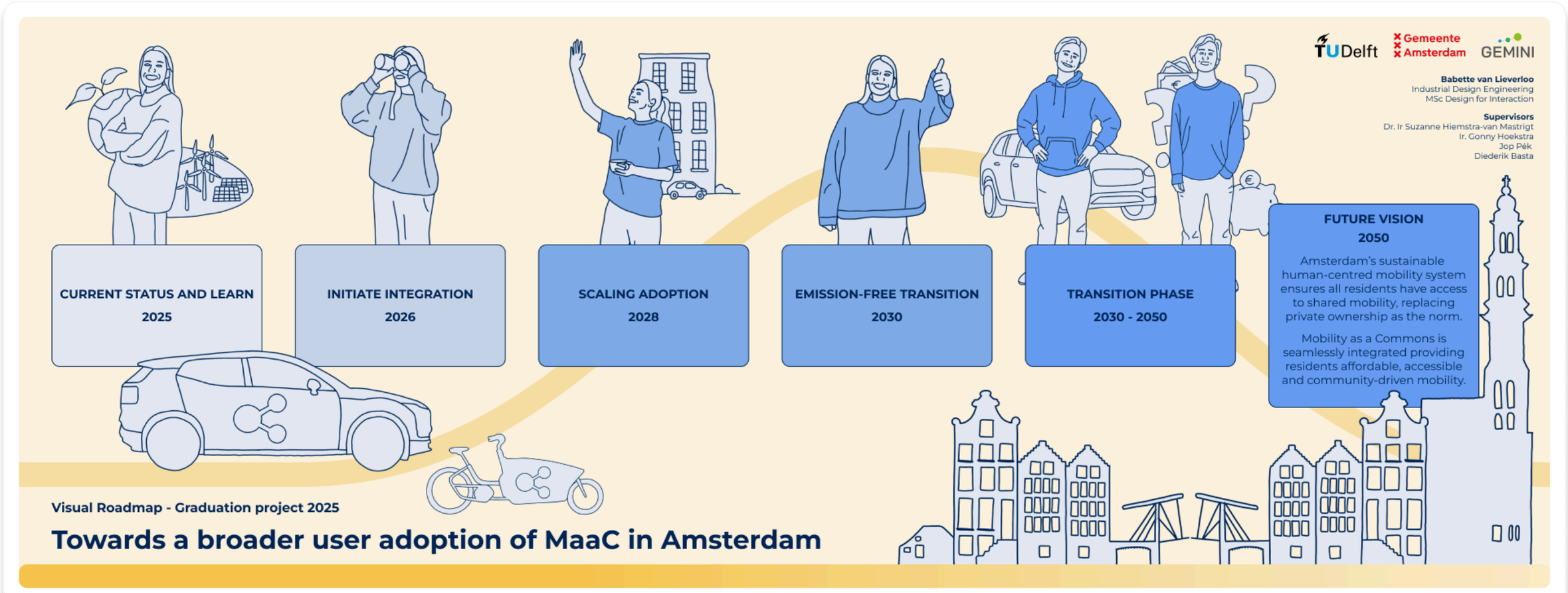
Horizon 3 - 2030: Emission-free transition

In 2030, Amsterdam will reach a key milestone: all mobility must be emission-free for both residents and visitors It will cause a transition in the mobility system of Amsterdam and is considered an important event to change how residents look at their mobility and force reconsideration. MaaC will be aligned, ensuring that shared mobility systems meet the rising demand as residents increasingly shift from private to shared vehicles (Gemeente Amsterdam, 2013).

Horizons 3 flows over into **the transition phase from 2030 to 2050,** which leads up to the future vision in 2050. During this period the distribution of MaaC in Amsterdam takes place, as initiatives start to either continue their growth or split into multiple smaller initiatives. The role of the Municipality is passive as initiatives can lead and support themselves. Every five years a reassessment of both MaaC and shared mobility will take place to further improve the policies.

10.2 VISUAL AND STRATEGIC ROADMAP

The visual roadmap serves as a tool to stimulate conversations with internal and external stakeholders by illustrating each horizon and need-based persona towards to the future vision.



Strategic Roadmap

Towards a broader user adoption of MaaC in Amsterdam



Legend

- text — Element
- Continuous process
- Connection
- Connection dot
- Intensity

Diffusion of innovation

- Innovators
- Early adopters
- Early majority
- Late majority
- Laggards
- Adoption threshold

Babette van Lieverloo
Industrial Design Engineering
MSc Design for Interaction

Strategic Roadmap
Graduation Project
10/02/2025

Supervisors
Dr. Ir Suzanne Hiemstra-van Mastrigt
Ir. Gonny Hoekstra
Jop Pék
Diederik Basta

TU Delft · Gemeente Amsterdam · GEMINI

10.3 ROADMAP ELEMENTS

The strategic roadmap consists of various roadmap elements which all contribute to the strategy towards the future vision. The roadmaps are grouped into five overarching categories: need-based personas, integration, the Municipality, events and infrastructure. This section describes each roadmap element according to the order of the categories.

10.3.1 Need based personas

10.3.2 Integration

10.3.3 Municipality

10.3.4 Events

10.3.5 Infrastructure

10.3.1 Need-based personas

The residents of Amsterdam are key stakeholders in this project. The roadmap provides a strategic plan for the Municipality to support the integration of MaaC by providing insights into the resident's needs, the residents are presented with need-based personas. Strategies for the adoption of MaaC are rooted in the Diffusion of Innovation theory (chapter 3), which emphasises the importance of engaging innovators and early adopters, therefore the personas reflect on the adopters groups. For the roadmap elements icons have been developed for the need-based personas (see Figure 70).



Figure 70 – The persona icons for the roadmap elements.

THE SUSTAINABLE ADVOCATE (INNOVATORS)

Horizon 0 - 2025

This group of key figures can be segmented as the innovators (see Figure 71), as they are enthusiastic and motivated risk-takers, who are the first ones to try new concepts. The same accounts for MaaC, which is a relatively innovation. The residents that take part in the 'Proef autodelen met een groep' can be segmented into this group. They are highly motivated, believe in their potential and contribute a lot of time and energy to their MaaC initiatives. This group is essential for trying and refining MaaC in its early stages, freeing and easing the way for others.

For the Municipality it is important to collaborate with this group and embrace their motivation and enthusiasm. Their feedback should be used to refine the policy and tackle the barriers before targeting a larger resident group.

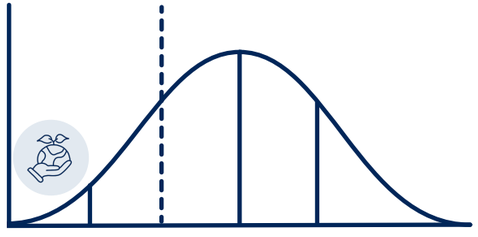


Figure 71 – The sustainable advocate positioned in the adopters' bell-curve to indicate their adopters segment.

THE AMBITIOUS EXPLORER (EARLY ADOPTERS)

Horizon 1 - 2026

This group can be segmented as the early adopters, who play a key role in the success of MaaC (see Figure 72). As motivated and enthusiastic individuals, they not only embrace innovation but also act as ambassadors who inspire broader adoption. Their willingness to invest time, energy, and resources into new concepts makes them key for adoption.

For MaaC, which relies heavily on community-based, bottom-up engagement, this group is fundamental as they will take on the role of key figures (see Chapter 4). As ambassadors, they will gain attention and support for MaaC by demonstrating its value, sharing positive experiences, and inspiring others to participate. To ensure the success of MaaC in Amsterdam, it is essential to actively identify and engage this group, empower them and facilitate collaboration with them.

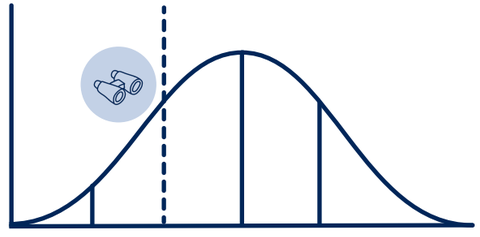


Figure 72 – The ambitious explorer positioned in the adopters' bell-curve to indicate their adopters segment.

THRESHOLD

Between horizon 1 and 2

The broader adoption of MaaC lies in successfully bridging the gap between early adopters and the early majority, the threshold that determines the success of an innovation (see Figure 73, see Chapter 3).

If this threshold can be successfully navigated, MaaC has the potential to seamlessly integrate into Amsterdam's mobility system. This transition would reach a broader group of residents, enhance the MaaC's value as more residents join and establish a foundation for long-term scalability and integration of MaaC.

In case the threshold cannot be bridged by 2028, it will be essential to conduct an evaluation to identify the barriers to adoption. This evaluation is already planned, see element Threshold evaluation. The success can be measured by multiple indicators such as an increase in demand for MaaC initiatives and increased development of MaaC initiatives in new areas.

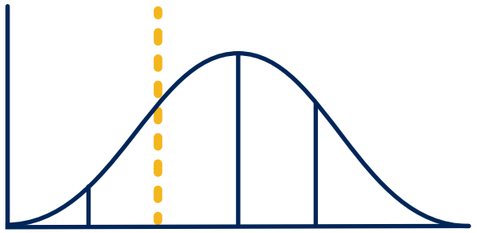


Figure 73 – The threshold highlighted in the adopters' bell-curve to show its position.

THE SOCIAL NEIGHBOUR (EARLY MAJORITY)

Horizon 2 - 2028

The persona aligns well with the early majority, who will adopt MaaC if they see tangible benefits and feel reassured by its success (see Figure 74). This group is key for overcoming the threshold.

To engage this group, clear communication about MaaC's proven benefits, such as lower costs or social cohesion, is needed. In the meanwhile, the ease of use and accessibility of the system needs to be ensured (such as seamless booking and easy finding initiatives). Information or trial days offer this group low-effort ways to explore and learn about MaaC and meet initiatives in their neighbourhood.

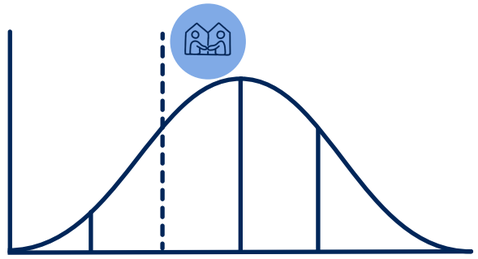


Figure 74 – The social neighbour positioned in the adopters' bell-curve to indicate their adopters segment.

THE CONVENIENCE SEEKER (EARLY MAJORITY)

Horizon 3 - 2030

The persona aligns well with the early majority, who will adopt MaaC if they see tangible benefits and feel reassured by the success of early adopters (see Figure 75). This group is key for reaching critical mass. This group will follow after the social neighbours have embraced the innovation as more success is assured and the convenience of MaaC is improved.

To engage this group, clear communication about MaaC's proven benefits, such as lower costs or social cohesion is needed. In the meanwhile, ensure that the system is user-friendly and accessible (seamless booking and easily find cooperations). Information or trial activities offer this group low-effort ways to explore and learn about MaaC and meet cooperations in their neighbourhood.

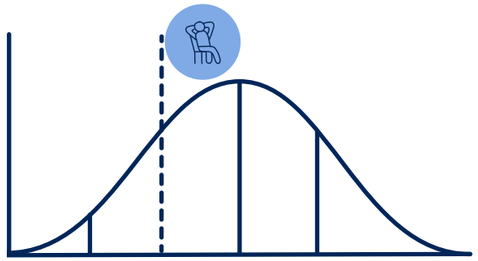


Figure 75 – The convenience seeker positioned in the adopters' bell-curve to indicate their adopters segment.

THE COMMITTED CAR USER (LATE MAJORITY)

Transition phase

This persona can be segmented as the late majority (see Figure 76). To engage this group, concerns such as reliability or costs should be addressed directly. Trial days or periods are an effective tool for this group to explore the benefits themselves, while probably learning that their concerns are irrelevant. For this group, MaaC must show clear advantages over private ownership, while also making private ownership more inconvenient.

Additionally, social norms could be leveraged to encourage participation, as they are often influenced by peer pressure or fear of missing out.

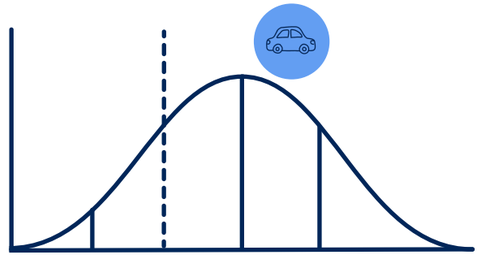


Figure 76 – The committed car use positioned in the adopters' bell-curve to indicate their adopters segment.

THE COST AWARE USER (LAGGARDS)

Transition phase

This group aligns with the laggards, who are resistant to change and adopt innovations only when necessary or unavoidable (see Figure 77). Its inclusion is relevant to designing a shared mobility system accessible for all residents. This group can benefit greatly from shared mobility and the potential of MaaC. The proposed senisitising plan is key for this group to get aquinted with shared mobility.

To engage laggards, the focus should be on ensuring accessibility for older, less tech-savvy or other populations by addressing their specific needs. The risks associated with the adoption of MaaC should be tackled and trust with these groups has to be established.

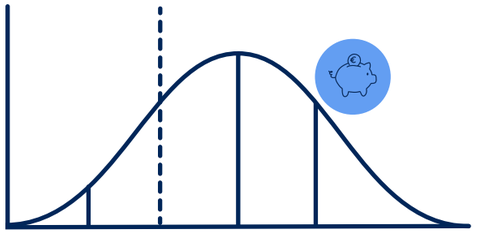


Figure 77 – The uninformed cost aware decision maker positioned in the adopters' bell-curve to indicate their adopters segment.

10.3.2 INTEGRATION

To seamlessly integrate MaaC into the mobility system of Amsterdam, a phased approach of integration is essential to ensure that MaaC aligns with municipal policies, community goals, and broader mobility systems. For seamless integration, it should be distributed all over Amsterdam to provide access to MaaC to all residents. Therefore integration and scalability of the integration is an important part of the strategic roadmap.

RESTRUCTURE 'PROEF AUTODELEN' STRATEGY

Horizon 0 - 2025

The trial 'Proef autodelen met een groep' is planned to run from 2024 to 2028, of which the GEMINI project that runs from 2024 to 2026 is part. However, considering the future vision, the aim of emission-free mobility and the integration plan it is advisable to reconsider the timeline of the trial.

The shift to emission-free mobility in 2030 will prompt many residents to re-evaluate their mobility, transitioning from fossil fuel vehicles to emission-free mobility. This regulation presents a key opportunity to influence habitual behaviour and be used to fasten the transition of access over ownership. To support residents during the transition and offer emission-free shared mobility, MaaC must be ready to be a desirable option. Starting the integration plan after the end of the trial in 2028 would limit the time available to establish scalable initiatives that are capable of meeting the anticipated demand. Therefore it is advised to align the trial timeline with the 2030 emission-free goals (see Figure 78). The initiatives of the trial should be able to continue their process and be integrated into the integration plan.

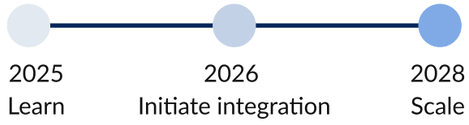


Figure 78 – The revised timeline for the trial strategy.

INTEGRATION PLAN

Horizon 1 - 2026

Research shows that initiatives mainly consist of two types of members: key figures and users (chapter 4). To integrate MaaC, the first step is to identify and motivate key figures in various neighbourhoods. The Municipality should provide support during the initial stages. Once the initiatives are stable, they can support themselves and grow into healthy, scalable organisations. Users join once initiatives are established and healthy, contributing to growth and financial stability.

As initiatives expand, they can follow two paths (see Figure 79). They may continue to expand, either within a single neighbourhood or across multiple neighbourhoods. This growth will contribute to financial stability and reduce the organisational burden. Alternatively, they might choose to split into smaller initiatives, protecting the close-knit community that fosters social cohesion and increased feeling of ownership. The decision can be made at any stage, depending on the specific needs and vision of the initiatives.

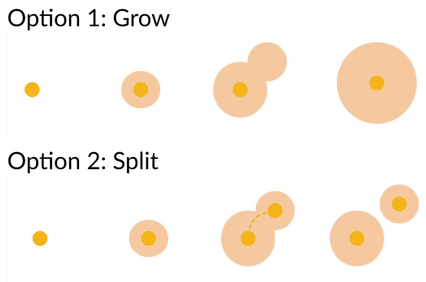


Figure 79 – A visual representation of how initiatives can either grow (top) or split (bottom).

FIND POTENTIAL GROUPS

Horizon 1 - 2026

Communities that are already collectively share, such as housing or energy cooperations, are high potential groups for MaaC (see Figure 80). They are familiar with sharing and often share core motivation such as sustainability and social cohesion (chapter 4). Their experience, eagerness to share and motivations make them ideal for the adoption of MaaC.

Once clear policies for MaaC are in place, the Municipality should target these groups, introducing them to MaaC. These groups have the potential to become key early adopters and contribute to broader adoption. Finding these key potential groups is an important and complex step. The Municipality must consider a variety of approaches to identify and reach out to them. Engaging with these groups early, understanding their needs and motivations, and providing support will be important to ensure their success in adopting MaaC.



Figure 80 – The icons represent the personas that relate to the potential groups: the sustainable advocate and the ambitious explorer.

FIND KEY FIGURES

Horizon 1 - 2026

Identifying and engaging these individuals is key to the successful integration and adoption of MaaC. Once these key figures are identified and inspired, with the proper knowledge, tools, and support, they can start their initiatives. Engaging with these residents, understanding their needs and motivations, and providing support will be key to ensuring their success in adopting MaaC and starting initiatives (see Figure 81).

Finding these key figures is a complex step. The Municipality must consider diverse approaches to identify and reach out to these residents. To ensure that key figures are inspired, MaaC should be accessible to adopt. The following requirements have to be met: clear and stable policy framework, transparent communication, and support contact at the Municipality.

This is a suggested strategy to show how MaaC can integrated in 2026. This does not mean that there cannot be more initiatives founded after 2026.

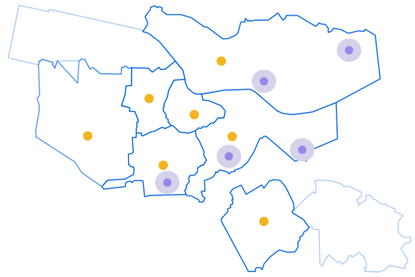


Figure 81 – A visual representation of the integration step. The orange dots represent the new initiatives. The purple represent the groups from the trial.

SMALL INITIATIVES

Horizon 2 - 2028

Once the base of the initiatives has been founded and the organisation is established, they are ready to slowly grow. The barrier of organisation is tackled, which holds the potential for new potential residents to become interested and adopt MaaC (see Figure 82).

The benefits of MaaC should be actively promoted. An interesting technique for this could be the storytelling of the successful initiatives as the early majority is inspired by the early adopters. Active marketing on MaaC could contribute to the transition.

The Municipality must support the initiatives in recruiting new members by collaborating on information days and promoting the initiatives in the neighbourhoods.

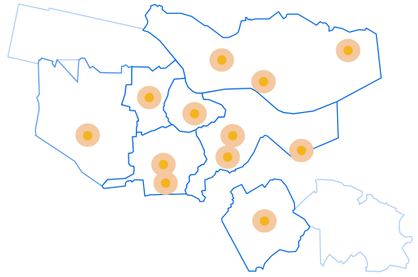


Figure 82 – A visual representation of the integration step. The orange dots represent the growth of the initiatives.

COLLABORATE WITH HOUSING DEVELOPMENT PROJECTS

Horizon 2 - 2028

Amsterdam's vision to become a low-car city has led to a scarcity of parking spots and permits, especially for housing development projects. For residents, this often means expensive or no parking, which prompts them to reconsider their mobility. This creates a valuable opportunity to transition residents from private ownership to access.

Many construction projects are required to include shared mobility options, currently, these are commercial parties. While this is a step in the right direction, not all residents may be open to commercial sharing. Introducing MaaC in these projects could offer a broader range of shared mobility options. The Municipality can collaborate with developers to introduce permits for shared parking and actively promote MaaC as an option.

The biggest barrier to the adoption of MaaC in these areas is the lack of social cohesion in new neighbourhoods. It is advised to research how to tackle this obstacle as MaaC has the potential to be a solution to the parking problems in these new neighbourhoods.

EXPAND INITIATIVES

Horizon 3 -2030

As in 2030 all mobility in Amsterdam must be emission-free, this systemic disruption holds the potential to be a catalysator in the mobility transition as most of the residents have to reconsider their mobility (chapter 3). The demand for electric mobility will grow, it is assumed that this will also increase the demand for shared mobility. MaaC could be a desirable option for community oriented residents who look for electric shared mobility. The demand for MaaC will grow leading to more stable and healthy initiatives (see Figure 83).

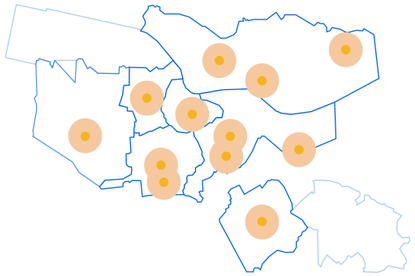


Figure 83 – A visual representation of the integration step. The orange dots represent the growth of the initiatives.

INITIATIVES CONTINUE GROWTH OR SPLIT

Transition phase

As the demand will continue to keep growing, the initiatives will also continue to grow. Based on the visions and goals of the initiatives, they have two options which are explained in the integration strategy: either keep on growing or split into several smaller Initiatives (see Figure 84).

Both events will contribute to the distribution of the cooperations over Amsterdam, offering more and more residents access to MaaC. Either of the options will slowly contribute to the decreasing need of expertise and support from the Municipality as new initiatives can learn from established initiatives.

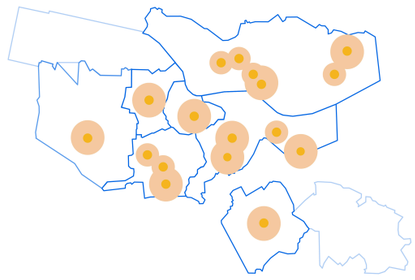


Figure 84 – A visual representation of the integration step. The orange dots represent the growth or splitting of initiatives.

10.3.3 The Municipality

The Municipality is the main stakeholder in this project, together with the residents of Amsterdam. The roadmap provides a strategic plan for the Municipality to stimulate and support the integration of MaaC by providing insights into what is needed for MaaC and into various residents' need. The Municipality is presented in this overarching theme displaying the role and activities expected from them to foster a broader adoption and integration of MaaC.

THE ROLE OF THE MUNICIPALITY

Horizon 0 -2025

The Municipality's role in MaaC is to facilitate, support, and collaborate while respecting the bottom-up nature of initiatives (see Figure 85). See the element card for each role for a detailed explanation.

In the beginning, more action from the Municipality is expected. As part of the three roles, actively stimulating and motivating residents to adopt MaaC is needed as well. Over time, the role when initiatives are stable and grown, will adapt and less is needed from the Municipality as members develop their expertise in MaaC and can support others. The role of collaborator will first start to become less relevant, after that, the support role will be followed. The role of the facilitator will stay relevant because the facilitation of practicalities such as policy is needed at all times for evaluation and improvement.



Figure 85 – A visual representation of the three roles of the Municipality: facilitator (top), supporter (left) and collaborator (right).

ROLE: FACILITATOR

The Municipality should enable success by facilitating a system in which MaaC can thrive. This includes providing and improving infrastructure, policies, and incentives for sustainable behaviour while discouraging unsustainable habits like private car ownership.

ROLE: SUPPORTER

As a supporter, the Municipality can offer multiple tools and resources that support different levels of integration. Financial support, legal guidance, and a MaaC platform with tools could be provided. The aim is to help initiatives with gaining expertise, financial barriers, promotion and scaling while ensuring MaaC is recognised as a legitimate shared mobility in the mobility system. Clear, transparent communication is key, with regular updates and accessible information for residents to understand MaaC and what to expect.

ROLE: COLLABORATOR

The Municipality should collaborate closely with initiatives to address challenges and barriers to further improve the framework of MaaC, without directly leading initiatives.

MID-EVALUATION 'PROEF AUTODELEN MET EEN GROEP'

Horizon 0 -2025

The mid-evaluation of the 'Proef autodelen met een groep' is an important milestone to assess the process and learnings of the partaking initiatives. This evaluation focuses on understanding how initiatives develop, residents' satisfaction, and the impact of MaaC on residents and neighbourhoods.

Actions for the Municipality

- Refine support: use the insights to determine what support (tools) initiatives need and tailor solutions to address the challenges.
- Refine policies: based on the insights improve the policy framework. It should address practical needs such as parking spots, permits, and charging.

To take on the role of collaborator, share the results transparently with the initiatives and residents and organise sessions to discuss findings and co-create solutions. Demonstrate how feedback and results are considered in shaping municipal support and facilitation.

By using this evaluation to refine facilitation, support and collaboration, the Municipality can strengthen the foundation of MaaC and stimulate broader adoption.

EVALUATION GEMINI PROJECT

Horizon 1 -2026

The GEMINI project evaluation is planned at the end of the GEMINI project (see Figure 86), it is an analysis of the trial and development of partaking initiatives. This evaluation is crucial for assessing how MaaC addresses the city's challenges and identifying key barriers to adoption. The evaluation should also focus on learnings and opportunities for improvement in role, policy and support tools.

Actions for the Municipality

- Finalise policy: use the findings to draw an official MaaC policy framework. This should include clear guidelines and practicalities such as parking and permits, and incentives for MaaC adoption. Ensure the policy supports both current and future MaaC initiatives. This should include clear steps on how to support and facilitate to distribution of MaaC and ensure facilitating infrastructure, such as charging, parking (and shared mobility HUBs.)
- Strengthening impact: evaluate the impact and contribution, particularly in emission-free and shared mobility.
- Integration strategy: based on the evaluation, improve the integration strategy.

Figure 86 – GEMINI logo.

THRESHOLD EVALUATION

Between horizon 1 and 2

The currently planned evaluation of the trial should be replaced by a threshold evaluation. With the integration strategy already rolled out in 2026, this evaluation should be focussed on evaluating whether the threshold has been overcome.

If this is not the case, it should asses if MaaC is not yet accessible for a broader group or if the early adopters have not shown success. The Municipality must collaborate with MaaC initiatives and key figures to address these challenges and conduct research to understand why other user groups are adopting MaaC. These findings can inform a revised integration strategy, refining it to better meet resident's needs and still reach its potential for seamless integration. The knowledge should be used to restructure the roadmap and revise the plan.

The next reassessment of MaaC will be a re-evaluation of the adoption. In case adoption stays limited, the Municipality is advised to explore more variations of shared mobility.

EVALUATION ON MAAC

Transition phase

Evaluations on MaaC should happen at least every five years to ensure its success, sustainability, and alignment with the Municipality's vision and residents' needs. These evaluations should monitor the integration, explore challenges, and inform policy reassessment. The five-year timeline aligns with the evaluation structure of the Municipality.

For each evaluation, the Municipality should reassess the policy, measure the impact and refine MaaC through feedback from initiatives.

MAAC POLICY

Horizon 1 - 2026

The Municipality must translate the trial policy into a clear and structured policy for MaaC following the evaluation of the ´Proef autodelen met een groep´ and the GEMINI project. This policy has to guide initiatives and create a transparent framework for MaaC. It will facilitate the foundation and organisation of MaaC initiatives.

Key elements of the MaaC policy

- Framework and support: define what is needed and expected to be a MaaC initiative. A clear procedure for the steps to be taken could be included.
- Impact indicators: set measurable indicators to evaluate the impact of initiatives and justify the support of the Municipality.
- Regulations: provide clarity on parking spots, permits and financial support.

REASSESSMENT OF SHARED MOBILITY POLICY

Horizon 1 - 2026

In 2027, the shared mobility policy will be reassessed. This provides a key opportunity to formally integrate MaaC into Amsterdam's shared mobility policy and promote official recognition, which is an important barrier to tackle when it comes to both Commons and MaaC (see chapter 2 and 4). This reassessment should position MaaC as a recognised in Amsterdam's mobility system.

A reassessment of policies appears every five years to improve, iterate and evaluate policies. Therefore the same will happen multiple times in the transition years from 2030 to 2050 (see Figure 87).

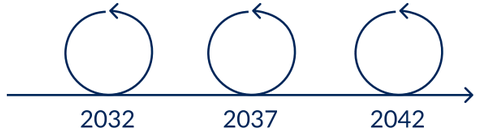


Figure 87 – A visual representation of the reassessmenet process every five years.

REASSESSMENT OF MAAC POLICY

Transition phase

As part of the shared mobility assessment, MaaC will be assessed as well to ensure the seamless integration of MaaC and reach the potential impact. It is important to focus on MaaC individually during this assessment and evaluate shared mobility as a whole because every form is structured differently and requires different approaches.

As these reassessments will appear multiple times in the transition from 2030 to 2050, the aim should be to adjust the policy in a way that makes it more accessible to the later adopters while also still matching the needs of the first groups. The aim is to make MaaC accessible for all.

REGULATIONS TO DISCOURAGE PRIVATE OWNERSHIP

Horizon 0 - 2025

This plan aims to make private vehicle ownership less appealing and convenient through systemic regulations. (see Figure 88) This approach ensures structural change, supporting the transition to sustainable shared mobility (S-frame, see Chapter 3).

Most of these regulations are already implemented by the Municipality, this contributes to the transition and must continue to be implemented. There is a risk of regulating that should be considered each time: if regulations are implemented too early and the system is not ready, it may face resident resistance.



Financial disincentives

Increase parking permit fees.



Limited parking

Reallocate parking space into bike lanes, green areas or pedestrian zones.
Maximise parking pressure.



Fossil fuel vehicles restrictions

Low or no emission zones.
Car-free zones.
Expand car-free areas.

Figure 88 – The proposed regulations to discourage private ownership.

SOCIAL MEASURES TO ENCOURAGE SHARED MOBILITY

Horizon 0 - 2025

This plan aims to make shared mobility the norm. It includes social incentives to shift cultural attitudes and behaviours (see Figure 89). This approach ensures social change, supporting the transition to sustainable shared mobility (I-frame, see Chapter 3).



Awareness campaign

Highlight financial costs.
Highlight sustainability
Show successful stories



Community engagement

Local ambassadors
Local workshop



Normalising sharing

Shift cultural perceptions
Social proofing

Figure 89 – The proposed social measures to encourage shared mobility.

SENSITISING PLAN FOR SHARED MOBILITY

Horizon 0 - 2025

This plan is designed to address the needs and context of residents unfamiliar with shared mobility, particularly those who prioritise saving money and require accessible services. The plan focuses on the needs and context of persona 'the uninformed, cost aware decision maker'.

Plan components include

- Tailored and transparent communication
- Language and formats tailored to their way of obtaining knowledge
- Diverse channels such as local newspapers and social media
- Clear services with ease of use and access
- Financial saving calculator tool
- Transparent and fixed pricing
- Promoting sharing with different groups such as neighbours, friends and family.
- Local demonstrations and information days
- Trial days & periods

All these activities can be found in different elements of the roadmap and are part of this plan. The goal of the plan is to get residents acquainted with shared mobility in general and all its different forms. In later stages, MaaC could be an interesting option for them yet they must first be familiar with the benefits and options.

STIMULATE PUBLIC AND ACTIVE MOBILITY

Horizon 1 - 2026

To stimulate the adoption of shared mobility, thus MaaC, it is important to decrease residents' dependency on cars. As is learned in the interviews with experts and initiatives, the less car-dependent an individual is, the higher the chances of adoption of shared mobility. Therefore, it is key to promote the use of both active mobility (walking, cycling) and public transport to reduce car dependency, support sustainable ambitions and reduce availability anxiety.

All are an effect of residents learning and experiencing that not only the car can provide them with their mobility. A keynote is that the Municipality should therefore also focus on improving the infrastructure of both public transport and active mobility to offer more possibilities and improve experience.

IMPROVE SHARED MOBILITY WEBSITE

Horizon 0 - 2025

The shared mobility website of Amsterdam currently provides an insight into the few different forms of shared mobility available, where these are located and the promotion of ease of use and benefits. The website could be improved by offering residents a more extensive overview of all the different forms of shared mobility, including key elements, benefits and barriers of each. Residents can find one that aligns most with their needs. As shared mobility in general is a key tool in the mobility transition, all forms should be promoted to fit the diverse range of needs of residents. The research conducted by the Natuurlijk! Deelmobiliteitsteam parallel to this project should be utilised to generate this overview of the various forms of shared mobility on the scale from commercial to commons[10]. The website should support residents in finding the right form for them.

To stimulate adoption, the website could also include positive experiences of residents per form, and storytelling, so that others can recognise themselves in these stories and find the best fit for their needs.

EDUCATE COMMUNITY WORKERS ON SHARED MOBILITY

Horizon 1 - 2026

As there is a general lack of trust in the Municipality in some neighbourhoods, it is advised to build a knowledge of, support and trust in MaaC from within the community by collaborating with community workers. These individuals are often trusted and valued residents in the neighbourhoods. By collaborating with them, the community-oriented approach can foster empathy and a better understanding, especially since the Municipality's usual communication methods may not align with residents' preferred styles.

Finding these community workers may be a complex process as they have to be open to taking upon such a role. An enjoyable and fair collaboration is key to success.

[10] This project has not been published yet, therefore the source is currently missing in this report. Howver, the MaaC-team has the report of Natuurlijk!Deelmobiliteit and can use it to include in their plans.

CAMPAIGN ON ALTERNATIVE ELECTRIC MOBILITY

Horizon 2 - 2028

As Amsterdam aims to achieve emission-free mobility by 2030, promoting alternative electric mobility is important to guide and support residents in this transition. As the emission-free regulation is a systemic disruption, it is a key opportunity to change the habitual mobility behaviour of residents (chapter 3). The disruption has the potential to be a key moment to shift attitude from private ownership to shared, electric mobility. This campaign should include both awareness of the upcoming regulation as well as awareness of alternatives to private ownership and shared mobility. For the campaign, the overview of all the various forms of shared mobility previously mentioned project from Natuurlijk! Deelmobiliteits could be utilised.

CREATE INTERNAL SUPPORT

Horizon 0 - 2025

Internal support within the Municipality is key for the seamless integration of MaaC into Amsterdam's mobility system. This ensures alignment across departments and secures the recognition, policy and infrastructure required for MaaC's success. These elements are key barriers to adoption for residents, therefore creating internal support and recognition is essential to stimulate the adoption of MaaC (see chapters 2 and 4).

Key activities to stimulate internal support

- Raise awareness and educate stakeholders.
- Policy integration in shared mobility and charging policy
- Cross-departmental collaboration

GENERATE INCENTIVES

Horizon 0 -2025

To promote MaaC in Amsterdam, a diverse range of incentives can serve as prompts to transition mobility behaviour and show clear advantages over other modalities (see Chapter 3). These interventions will respond to motivations, lower barriers, and encourage adoption (see Figure 90).



Parking

Designated parking.
Free parking.
Reserve individual parking permit to try out MaaC.



Urban development

Giving MaaC initiatives a say in the planning and development of urban space in their neighbourhood can be a motivation for MaaC to free up and improve urban space.



Dedicated charging stations

This will make MaaC more appealing than private ownership as it reduces the need to search for a station and increases reliance.

Figure 90 – The proposed incentives to stimulate adoption.

FINANCIAL SUPPORT PLAN

Horizon 0 - 2025

Financial support is essential, especially in the early stages of both the integration and initiatives (see Chapters 4 and 9). Start-up and operational subsidies lower the financial barriers, making it more accessible for key figures to start an initiative. A risk is associated with starting a MaaC initiative as residents personally have to invest in the group to lease vehicles and recruit new members. By offering financial support, the Municipality could reduce this risk and contribute to the development of new initiatives.

In addition, subsidies for membership fees could help attract residents with a lower income. This incentive aligns with the vision that shared mobility should be accessible for all. MaaC is a more affordable option than commercial sharing, yet it could still be too expensive for some resident groups. A subsidy could contribute to more residents having access to shared mobility. This has been proven to be effective and possible (see Chapter 4).

The first official financial support plan should be ready in 2026 to inspire new key figures to start MaaC initiatives. The plan can be revised alongside the assessments of MaaC's policy. It is expected that when MaaC further integrates and more initiatives are established, the need for financial support will decrease over time.

MAAC CAMPAIGN

Horizon 1 - 2026

A campaign should promote MaaC as a sustainable, recognised, shared mobility alternative to private car ownership. MaaC currently is not a widely known form of shared mobility, a campaign should raise awareness among residents that MaaC could be an option for them and encourage adoption. Aside from spreading knowledge about the possibility of MaaC, the campaign could also be used by initiatives to spread the word about their community and attract potential residents from their neighbourhoods to join.

This campaign should be included in the alternative electric mobility campaign.

MAAC WEBSITE

Horizon 1 - 2026

Creating a website for MaaC is key to ensuring that potential residents and both new and existing initiatives can easily access the information and tools they need. The website should serve as a platform for MaaC-related content, providing user-friendly content and interface.

The website could include

- **A design package:** offering a step-by-step guide for anyone looking to start a MaaC initiative. This package could include guidelines, a basic framework and tips and tricks.
- **FAQ:** This should address common questions and concerns. It can provide residents with instant support.
- **Link to a helpdesk:** this should be available for residents who require further assistance with personal advice or complex questions.
- **Overview of technologies/platforms:** a clear overview of the technologies/platforms available for MaaC which can provide apps, operation systems or financial aids.
- **Overview of experts** who can give advice, support, or collaboraton opportunities. This should facilitate connections and exchange of expert knowledge so not every new initiative has to reinvent the wheel.
- **Overview of existing initiatives:** this should offer residents the opportunity to check if there are initiatives in their neighbourhood and connect them.
- **Tools and resources** such as calculation tools for calculating financial benefits.

MAAC-TEAM (INTERNAL)

Horizon 2 - 2028

A MaaC-team within the Municipality of Amsterdam must be established to support, collaborate and facilitate MaaC (initiatives) and continuously improve MaaC. This team must be the contact person for residents to approach when they need help.

Team responsibilities

- **Support initiatives:** offer assistance to initiatives, from development to guidance.
- **Facilitate collaboration:** act as a middle person between the Municipality and MaaC initiatives.
- **Policy development:** refine and reassess policies that address legal and logistical challenges.
- **Monitor and evaluate:** track MaaC's progress and impact.
- **Knowledge sharing:** serves as an internal resource providing knowledge on MaaC to stakeholders and residents.

ORGANISE INFORMATION & TRIAL DAYS

Horizon 2 - 2028

To stimulate adoption and support initiatives with their growth, it is key to organise information and trial days for MaaC. On these days residents can directly receive information on MaaC or initiatives. Trial days can offer opportunities to experience MaaC before commitment and meet members of initiatives. It is an effective way to encourage MaaC adoption by building trust and showing the benefits (see chapters 3, 4 and 9). For the organisation of these days, the Municipality can collaborate with the initiatives to provide knowledge and spread the existence of the initiatives. It could also bring together potential residents and initiatives who might match.

10.3.4 'Events'

Events play a role in the strategic roadmap. Over the years multiple events such as emission-free zones will impact the residents, drive awareness and adoption and stimulate the mobility transition.

EMISSION FREE ZONES

Horizon 0 - 2025

Amsterdam has a low emission zone for diesel vehicles older mopeds and motorised bikes and will introduce a zero emission zone from 2025 for various vehicles. The ring of the A10 road is the boundary for the low-emission zones. For mopeds, this boundary is the built-up area and zero emission is allowed.

The introduction of emission-free zones for certain vehicles is a step towards the emission-free vision for 2030. This event will encourage residents to rethink their mobility in case they own fossil-fueled scooters (Amsterdam, n.d.).

END OF GEMINI PROJECT

Horizon 1 - 2026

In 2026 the GEMINI project will come to an end, as a result of the end of the project an evaluation is planned to evaluate the success of the project and retrieve the learnings from both organisations and initiatives. It is a key moment that prepares the start of the integration plan (see Figure 91).

Figure 91 – GEMINI logo.

INNOVATION PROGRAM ON BIDIRECTIONAL CHARGING

Horizon 1 - 2026

Currently, there are explorations on bidirectional charging. In Amsterdam, this technology is being tested. The studies mainly focus on this technology for privately owned vehicles. However, bidirectional charging will also affect shared electric vehicles. The technology carries quite a few complications and sharing makes it a bit more complicated. The Municipality needs to know what to do with bidirectional charging for both private and shared mobility. Therefore, it is advised to start an innovation program for bidirectional charging specifically on shared mobility to be ready for when the technology is widely implemented.

The technology could be an addition to the MaaC concept, as energy can be shared via the vehicles. This is currently being explored by an initiative (see Chapter 4). It would be interesting to collaborate with them to learn about how to use bidirectional charging for MaaC initiatives. Also in Utrecht, they are testing bidirectional charging in shared mobility. It would be interesting to learn from them to apply in Amsterdam (Lugt, 2024).

EMISSION FREE MOBILITY IN AMSTERDAM

Horizon 3 - 2030

In 2030 Amsterdam will require all vehicles in the city to be emission-free (see Figure 92, Gemeente Amsterdam, 2013). This is a key event in the transition towards sustainable mobility. Residents who do not own or have access to emission-free vehicles will have to reconsider their mobility. It is an important opportunity to stimulate the transition from ownership to access, promoting the use of shared mobility. This is a key moment for MaaC to grow as it can offer residents emission-free shared vehicles via community-driven mobility.

In case of successful stimulation, the demand for electric shared mobility will grow, and thus might also stimulate the demand for MaaC initiatives. Both policies, infrastructure and initiatives need to be ready for a decrease in demand to offer new members a positive experience in their transition.

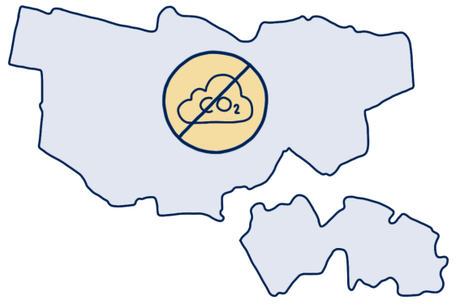


Figure 92 – A schematic overview of the map of Amsterdam highlighting emission-free city.

BIDIRECTIONAL CHARGING

Horizon 3 - 2030

Bidirectional charging is a way of charging where the car could also give energy back to the grid (see Figure 93). It results in EVs being driving batteries, which links the mobility and energy transition. A possibility could be that vehicles can capture extensive green energy and release the tension on the grid, while also providing for energy when the availability of energy is low. This technology promises to be an addition to both the mobility and energy transition.

Bidirectional charging is currently available for a few EVs. In 2030 it is expected to be more widely accessible (Gemeente Amsterdam, 2020). With the advised innovation program the Municipality should be ready for the impact of bidirectional charging.

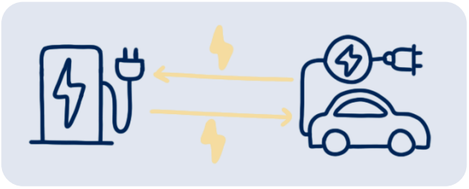


Figure 93 – A schematic overview of bidirectional charging. The orange arrows highlight how energy goes in both direction, indicating that the electric car can serve as a battery.

10.3.5 Infrastructure

Infrastructure is a key requirement for MaaC to successfully integrate into Amsterdam's mobility system and make shared mobility accessible for all residents. The infrastructure provides the foundation for mobility systems, a well-designed one can ensure accessible, reliable and safe mobility for residents. Infrastructure must address key challenges like parking spaces such as HUBs and charging stations. Reducing the dependency on car ownership in the infrastructure, shared mobility becomes a viable, feasible and desirable option for residents.

GREEN DEAL: EMISSION FREE EU

Transition phase

The European Union (EU) Green Deal aims to make Europe the first climate-neutral continent by 2050, with ambitious goals for emission-free, renewable energy, and cleaner and greener urban spaces (Mobility Strategy, n.d.).

In the context of mobility, the Green Deal emphasises the adoption of sustainable and electric mobility systems. By 2050 nearly all mobility will be zero-emission. This development will lead the mobility transition and stimulate the adoption of shared mobility. Amsterdam's mobility system should contribute to this environmental target and offer sustainable, accessible mobility. Amsterdam can strengthen its leadership in sustainable mobility and ensure compliance with EU regulations.

URBAN SPACE PROJECTS

Horizon 0 - 2025

For residents to embrace and adopt shared mobility concepts such as MaaC the infrastructure should allow for that and stimulate the adoption (S-frame, see Chapter 3). The program 'Amsterdam maakt ruimte' is aimed to improve the urban space to meet the vision of the city (see Figure 94). For the coming years up to 2050, many projects for development and improvement have been planned to support Amsterdam's mobility transition towards more sustainably and active mobility. The projects focus on infrastructure for bicycles, public transport and walking, such as the redesign of the 'binnenring' to improve the use of bicycles and public transport which is aimed to be ready in 2026, contribute to the improvement of the urban space (Gemeente Amsterdam, 2023). These ongoing projects that improve infrastructure and urban space will contribute to the integration of MaaC.



Figure 94 – A sketch of the envision urban space in 2050 (Gemeente Amsterdam, 2021b).

HUBS

Horizon 0 - 2025

HUBs are an important element in the mobility transition. In the coming years, more HUBs will appear in and around Amsterdam (see Figure 95). These range from neighbourhood and district HUBs with (electric) shared mobility (Gemeente Amsterdam, 2021a). HUBs offer more mobility options and improve accessibility to modalities, and contribute to the city's vision. HUBs drive the transition towards a more accessible and sustainable urban mobility system.

HUBs can contribute to successful integration of MaaC in Amsterdam. They could offer residents clear spaces where shared vehicles can be parked or charged (see element Charging infrastructure for shared mobility). They also offer MaaC members the opportunity to easily connect with other shared vehicles or public transport.



Figure 95 – A computer sketch of a HUB (Gemeente Amsterdam, 2021a).

CHARGING INFRASTRUCTURE

Horizon 0 - 2025

For a successful transition to emission-free vehicles, the charging infrastructure is a key part as charging must be accessible and convenient for residents to transition from fossil fuel to electric. For the coming five years, Amsterdam has developed a strategic plan dedicated to upscaling and improving the charging infrastructure. By 2030 there should be 50.000 private, 13.000 semi-public and 18.000 public charging stations available. The aim is to distribute public charging stations as much as possible around neighbourhoods (Gemeente Amsterdam, 2020).

The strategy mainly focuses on regular, fast and ultrafast charging. Smart charging, such as bidirectional charging, is mentioned in the plan but is not actively engaged besides a trial at the Johan Cruyff Arena.

CHARGING INFRASTRUCTURE FOR MAAC

Horizon 0 - 2025

For the success of MaaC, it relies on supporting charging infrastructure. To support and facilitate the adoption of MaaC, it is essential to provide reliable, accessible and efficient charging options for shared vehicles. It is a foundational step in stimulating the transition to sustainable mobility. The following two options for charging infrastructure for MaaC are proposed.

- **Designated charging stations for MaaC vehicles**
- **e-HUBs for shared mobility**

All in all, Amsterdam needs to improve their charging infrastructure and work on a clear policy for shared mobility. The policy must be considered to ensure electric shared vehicles are more convenient than private electric vehicles (see Chapter 3).

10.4 ROADMAP ADDITIONS

This section provides various additions to the strategic roadmap. Requirements and recommendations are presented that support the strategic roadmap. The section concludes with an infographic on key elements and tips for MaaC initiatives.

10.4.1 Requirements for the succesful integration of MaaC

The success of MaaC in Amsterdam depends on several Requirements that must be addressed to ensure seamless integration into Amsterdam's mobility system.

Stable policy and formal recognition
The roadmap presents this recommendation, yet due it is importance is it emphasised here. A clear and stable policy framework in combination with formal recognition is key. This will provide consistency and guidance for both residents and the internal MaaC-team, creating the foundation for trust and long-term investment in shared mobility solutions.

Improved public transport system
The need for decrease of car dependendcy to transition to shared mobility is emphasised throughout to project. A key factor in car dependency is the access to public transport. Aside from focussing on the development of shared mobility, it is important to invest in improving the public transport system in and outside Amsterdam to offer mobility options next to shared mobility.

10.4.2 Recommendations for the Municipality

In this section, additional recommendations, that support the roadmap, are highlighted.

Encourage patience
The mobility transition requires time and a long-term vision. The Municipality should manage expectations, internally and externally, by being transparent and clear about the progress, challenges, and decisions. This will foster understanding and patience.

Transparant communication
As mentioned, transparent communication, both internally and externally, is key to foster understanding, address potential resistance and build trust. This could include the reasoning behind policy decisions as well as the impact of shared mobility.

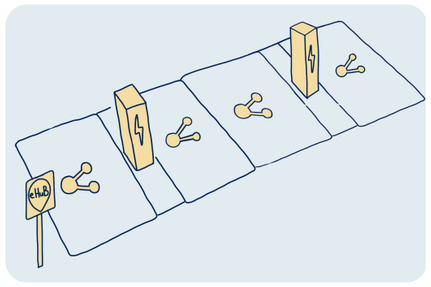
Consider capacity of key figures
The Municipality should appreciate the valuable efforts of volunteers in MaaC initiatives. Given their limited capacity, the Municipality should offer support to help them succeed and manage expectations. Keeping the bottom-up character of MaaC in mind is key when defining these expectations. Working closely with key figures, the Municipality can build trust and demonstrate a shared commitment to the same goals.

Adress parking and charging infrastructure
Designated parking and charging infrastructure for MaaC initiatives can play a important role in ease of use and encouraging adoption. Clear policies should ensure that shared electric vehicles are more convenient to use than private electric vehicles, further stimulating the transition to shared mobility. Figure 96 presents two options for the charging infrastructure for MaaC that are advised in the roadmap element '**Charging infrastructure for MaaC'.**

PROPOSED OPTIONS FOR CHARGING INFRASTRUCTURE MAAC

e-HUBS for shared mobility

The introduction of e-HUBs for shared mobility would provide easy access to shared electric vehicles and charging which reduces the need for search to public charging stations. They can also serve as an incentive to transition to shared mobility due to accessible charging stations.



Designated charging stations for MaaC

These designated spots will ensure that shared vehicles have reliable access to charging stations and, a fixed set of charging prices and enhance user experience (see chapters 4 and 9). To optimize resource utilization, dual-use charging stations are advised. These stations would serve both shared and public vehicles, each on one side of the charging station to ensure efficient use. To ensure optimal use, access to these spots should be based on meeting predefined criteria. For example, MaaC vehicles could be required to meet minimum usage thresholds (e.g., a certain number of kilometres driven monthly) to qualify.

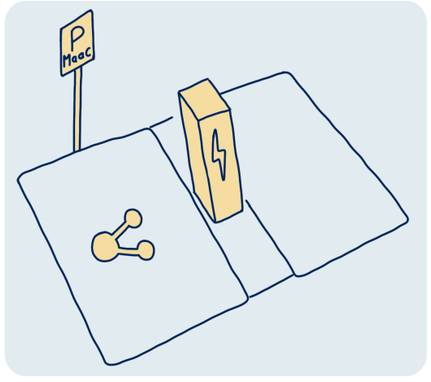


Figure 96 – An overview of the two proposed option for charging infrastructure of MaaC that are presented in the roadmap element 'Charging infrastructure for MaaC'.

10.4.3 MaaC key elements and tips infographic

The following infographic contains key elements and tips retrieved from several research activities (see Figure 97). These have been retrieved from the experience of the existing iniatives (see Chapter 4). The Municipality could use this to guide initiatives with key elements that could lead to successful initiatives.

KEY ELEMENTS AND TIPS FOR MAAC INITIATIVES

Financial

Transparant costs.
Stable fixed costs.
Distribution key for variable costs.

Organisation

Bottom-up organisation.
There is a certain level of professionalism.

Mobility

Access to public transport.
Clear agreements regarding insurance and maintenance.

Ownership

Vehicles are collectively owned by all.
All members have a sense of ownership.

Community and collaboration

The collaboration is positive.
There must be trust among the members.
All members are equal.

Designated charging stations for MaaC

- *A healthy scale for financial stability, higher dependency on availability and fair distribution of organisational tasks*
- *A balance in the type of members: diverse needs and expertise*
- *Advertise through local activities, local social media, word of mouth and local paper.*
- *Offer trial periods for potential members to lower the barrier and let people first experience before fully committing. This offers people the chance to experience that most often their fear is irrelevant.*
- *Organise trial and meet days for residents to try out the cars or ask questions directly to cooperations. Get a face to the cooperation.*
- *Provide an accessible onboarding, it is advised to do a physical onboarding, so you get to meet the new members ensuring less anonymity.*
- *To decrease the anxiety of availability, offer members a backup option, either a commercial sharing vehicle or stimulated public transport.*
- *Organise activities where members can meet each other to maintain a friendly group.*

Figure 97 – The infographic containing key element and tips for residents who want to start a MaaC initiative.

10.5 IMPLEMENTATION

To help ensure that the roadmap can be effectively implemented by the MaaC team, a digital tool has been developed (see Figure 98). It is designed to engage with internal and external stakeholders, turning the roadmap into a practical, accessible and collaborative tool.

For the implementation, an interactive PDF has been developed. This PDF can be shared during stakeholder meetings, either online or in person. After a brief introduction to the context and roadmap, the interactive tool can be displayed on the screen. Each element has its own card to offer key details. Stakeholders can click on the elements to access more in-depth information and to make it easier to understand and navigate the roadmap. The interactive tool supports collaboration.

For these stakeholder meetings, a brief introduction should be created to provide the necessary context behind the roadmap. The visual roadmap offers a valuable tool to support the introduction. It should highlight the problem definition, the future vision, the need-based personas and the requirements for the successful adoption of MaaC.

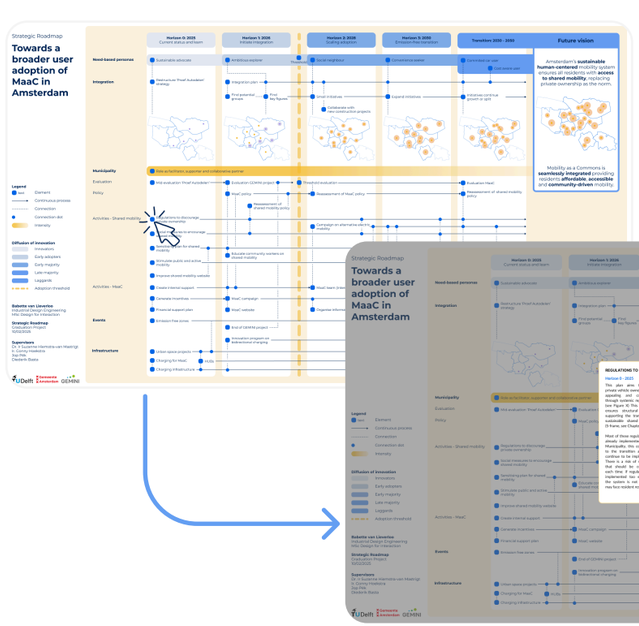


Figure 98 – An impression of an interaction with the strategic roadmap.



A 'buurthub' (neighbourhood HUB) in a neighbourhood in Amsterdam. Photograph taken by author.

11.

CONCLUSION

This closing chapter concludes the graduation project on the broader adoption and seamless integration of MaaC in Amsterdam. It provides a discussion on the project and a final conclusion.

11.1 DISCUSSION

11.2 CONCLUSION

11.1 DISCUSSION

This project has demonstrated the potential of MaaC as a sustainable, community-driven alternative to private car ownership in Amsterdam's mobility transition. It highlights the importance of a context-specific approach in fostering broader adoption and the key role the Municipality plays in this process. This section reflects on the limitations, provides recommendations and discusses the value of the project.

11.1.1 Limitations

While this project offers valuable insights, several limitations should be acknowledged. Addressing these limitations in future research will enhance MaaC's potential as a sustainable, community-driven tool and can expand the findings' applicability to other domains and contexts. Each limitation is followed by a recommendation to address it.

Exclusion of certain resident groups

The selection of two neighbourhoods limits the scope of the data collection and excludes areas with potentially different needs. As a result, the findings may not reflect all the various user needs across a wider range of neighbourhoods.

However, this research has provided valuable indications and the use of need-based personas ensures that the proposed strategic roadmap is applicable to other neighbourhoods that align with the identified personas. It is recommended to conduct a more extensive user research that analyses more segments and incorporates multiple neighbourhoods within each segment to improve the generalisability of the findings.

Effect of the proposed interventions

Engaging residents in the user research was complex, as residents were generally hesitant to participate and a key challenge was their limited familiarity with MaaC or shared mobility. The decision was made to prioritise expert feedback rather than collecting resident feedback for the optimisation of the roadmap.

However, it is recommended that future research actively collaborates with residents to refine the intervention elements of the proposed strategy, such as the proposed incentives or co-creating an awareness campaign, too refine its effectiveness.

Long-term sustainability assessment

While MaaC presents a promising solution for reducing car ownership and emissions, its long-term sustainability impacts were not assessed within the scope of this project. This means that while short-term adoption seems sustainable, there is no validation of its long-term impact. Future research should investigate the long-term sustainability impacts of MaaC to support the statement that MaaC is a sustainable solution.

Potential researcher bias

A limitation which has to be recognized is the potential researcher bias in the interpretation of the data as the research has been performed primarily by one researcher. To reduce the risk, the findings have been discussed multiple times with the supervisory team and members of the MaaC team to evaluate the analysis.

11.1.2 Recommendations

To further enhance the potential of MaaC and its broader adoption and integration, this section outlines key recommendations.

Explore the full range of shared mobility

The project highlights that shared mobility should be seen as a complete tool playing a key role in the mobility transition. To make the most of its potential, it is recommended to explore the full range of shared mobility options, from commercial services to MaaC initiatives. By offering a variety of shared mobility solutions, Amsterdam can better meet residents' various needs and stimulate the shift from private car ownership to shared mobility.

Apply learnings beyond mobility

Beyond mobility, MaaC has the potential to stimulate a broader shift towards organising in Commons. The project shows the potential of community-driven solutions for urban challenges. The key findings on the defined role of the Municipality can potentially be applied to other Commons organisations, such as energy or living cooperations. The role of facilitator, supporter and collaborator remains consistent across different community-driven domains. It is recommended to collaborate with experts, such as the AmsterDOEN project, to expand understanding and contribute to formal recognition of Commons, reinforcing the potential of Commons-based organisation as a powerful tool for sustainable urban development.

Collaborate with other cities

While this project focuses on Amsterdam, the insights are relevant to other municipalities in the Netherlands with similar urban mobility challenges. Since the Municipality is involved in the GEMINI project with MaaC, the insights can contribute at European level. It is recommended to collaborate with other municipalities and European cities to further develop and refine MaaC and its potential in the mobility transition towards the EU Greendeal.

Track and assess MaaS developments

MaaS was deliberately excluded from the roadmap due to its current complexity and unsure future. However, future research should track its development. This could provide valuable insights into how MaaS might complement or compete with MaaC and what its impact on shared mobility, in general, is going to be.

11.1.3 Value

This project offers significant value for the three main stakeholders: the Municipality, residents academia. The value for each is highlighted in this section.

Value for the Municipality

For the Municipality, this project provides a detailed strategic roadmap for broader adoption of MaaC that is aligned with its broader mobility transition. It outlines what needs to happen and why it is necessary and be used to engage internal and external stakeholders in the plans.

Additionally, the project addresses neighbourhoods such as the Lodewijk van Deysselbuurt, where there is typically a lack of shared mobility due to unfamiliarity and a good business case. Despite these challenges, these neighbourhoods can benefit from the potential of shared mobility, and MaaC. The project successfully aligns with the wish from the SMP to develop a strategy that includes all residents, proving that a more inclusive approach to shared mobility is feasible.

Value for residents

The project highlights the role MaaC can play into Amsterdam's mobility transition and encourages the Municipality to formally recognise and support MaaC, improving its framework and addressing current challenges. This will support and ease the way for residents who want to adopt MaaC. Additionally, due to its affordability, promoting MaaC can be valuable for lower-income residents, helping to reduce the financial burden of mobility while ensuring accessible and community-driven mobility.

Value for academia

This project represents one of the first in-depth studies on MaaC, offering valuable insights for municipalities, researchers and residents who want to explore MaaC. While the majority of current research focuses on commercial sharing, this research offers valuable insights into how MaaC can enhance social cohesion, affordability, and accessibility and provides a strategic roadmap for stimulating integration and adoption. It bridges theoretical research with practical research, providing a more in-depth understanding of MaaC's potential in the mobility transition.

11.2 CONCLUSION

This graduation project has explored the potential of MaaC as a sustainable tool in Amsterdam's mobility transition while addressing the challenges of broader adoption by residents. The goal was to design a strategy that supports the integration of MaaC into Amsterdam's mobility system by addressing residents' needs, motivations and barriers. The proposed strategic roadmap aims to guide the Municipality of Amsterdam in stimulating a broader adoption of MaaC. It focuses on realising the future vision for 2050: Amsterdam's sustainable and human-centred mobility system ensures all residents have access to shared mobility, and MaaC is seamlessly integrated, providing affordable, accessible, and community-driven mobility options.

MaaC supports the Municipality's vision by reducing private cars and ensuring affordability and accessibility. Its bottom-up organisation allows residents to take control of their mobility. The research findings demonstrate that MaaC holds the potential to be a viable, desirable and feasible alternative to private car ownership for the Municipality and the residents.

The Municipality plays a key role and should adopt the roles of facilitator, support, and collaborator to stimulate the integration and adoption of MaaC. Facilitating includes providing infrastructure, policies and behaviour incentives, supporting includes offering tools and resources such as financial support and legal and collaborating means working with residents to improve the behaviour incentives, supporting includes offering tools and resources such as financial support and legal and collaborating means working with residents to improve the framework of MaaC. Over time, the Municipality's active role may decrease as initiatives become more self-sufficient.

Other key insights from the research emphasise the importance of MaaC's bottom-up organisation, MaaC's scalability and the need for a human-centred and context-specific approach. Moreover, it shows the importance of collaboration among municipalities, residents, and other stakeholders in realising MaaC's potential.

The proposed strategic roadmap presents a structured framework for MaaC adoption, highlighting the importance of addressing systemic and individual barriers. It aims to guide the Municipality in its defined role. The iterative design process of the roadmap, combined with expert feedback and supervisory validation, ensured that it aligned with Amsterdam's broader mobility transition. It builds on the design criteria of sustainability, human-centred design, empowerment of residents, and scalability. Sustainability is embraced through promoting shared mobility solutions over private ownership. Human-centred is implemented through user research and need-based personas. Scalability is enhanced through the integration plan that outlines how MaaC can grow and adapt to different neighbourhoods and contexts. The community-driven character is respected through the role of the Municipality as a facilitator, supporter and collaborator rather than the organiser.

In conclusion, this graduation project offers a human-centred strategic roadmap for MaaC adoption in Amsterdam, contributing to the city's mobility transition. It also has the potential to serve as an inspiration for other cities facing similar urban mobility challenges. MaaC is a key player in the transition towards a more sustainable and human-centred mobility system, providing affordable, accessible, and community-driven shared mobility for residents.

PROCESS REFLECTION

PROCESS REFLECTION

This project has been a valuable learning experience, highlighting the gap that exists between theoretical frameworks and the practical world. The most important lesson I have learned is the importance of early user engagement in user research. Initially, I invested a lot of time in developing a detailed user research plan before taking action. However, once I started with the observations and talking to residents on the street, it became clear that reality was different to the theoretically developed user research plan.

If I were to repeat the process, I would adopt a more iterative and exploratory approach to user research. Rather than immediately diving into the specifics of methodologies, questions, and procedures, I would first develop a plan focused on what I aim to learn and why. Then, I would start with observations and casual conversations with people on the streets. This would provide valuable context and insights that could inform a more tailored and effective user research plan. By doing so, I could save time and ensure that the research methods are adapted to the unique context of each user group, recognising that one approach does not fit all. Applying this way of working would maybe also manifest a more open-minded attitude during the first observations as you will be less likely to look for the answers to the questions you have developed and more open to all kinds of insights, which may inspire new directions.

Another key learning is the importance of asking for help and using the expertise and strengths of your team, definitely when it comes to resident participation. At the start of the project, I felt that I needed to do everything on my own to demonstrate my abilities. However, when there were challenges, such as the complexity of engaging with residents, I realised that I needed and could ask for help.

When working with user groups where a topic might be more sensitive, it is helpful to ask for help from an expert on such topics and in my case familiar with resident participation in sensitive areas. By embracing the expertise of my team, I was able to address these challenges more effectively. My team members brought diverse perspectives and skills that enriched the project and developed my skills further.

REFERENCES

A

Agrawal, A., Erbaugh, J., & Pradhan, N. (2013). The Commons.

Amsterdam. (n.d.). Low emission zone for diesel vehicles only [Webpagina]. https://www.amsterdam.nl/en/traffic-transport/low-emission-zone/

AmsterDoen—Samenwerken aan sociale en duurzame stad. (2022). https://openresearch.amsterdam/nl/page/85918/amsterdoen---samenwerken-aan-sociale-en-duurzame-stad

ATLAS.ti. (n.d.). ATLAS.ti | The #1 Software for Qualitative Data Analysis. https://atlasti.com

B

Blomley, N. (2008). Enclosure, Common Right and the Property of the Poor. Social & Legal Studies, 17(3), 311–331. https://doi.org/10.1177/0964663908093966

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Buhler, T. (2020). Habit as a better way to understand urban mobilities. In Handbook of Urban Mobilities (Eerste, p. 10).

C

Caulfield, J. (2019, September 6). How to Do Thematic Analysis | Step-by-Step Guide & Examples. https://www.scribbr.com/methodology/thematic-analysis/

Cenex Nederland. (2024, November 17). Cenex Nederland | Clean Mobility Research and Consultancy. https://cenexgroup.nl/

Chater, N., & Loewenstein, G. (2023). The i-frame and the s-frame: How focusing on individual-level solutions has led behavioral public policy astray. Behavioral and Brain Sciences, 46, e147. https://doi.org/10.1017/S0140525X22002023

CROW. (n.d.). Inzicht in acceptable loopafstanden. CROW - KpVV.

D

Dashboard kerncijfers | Website Onderzoek en Statistiek. (2019). https://onderzoek.amsterdam.nl/interactief/dashboard-kerncijfers?tab=indicator&thema=bevolking&indicator=BEVTOTAAL&indeling=ggwgebieden&jaar=2024&gebied=GA01&taal=nl

DEEL - Niet huren maar delen. (n.d.). https://wijzijndeel.nl/

Design Council. (n.d.). The Double Diamond—Design Council. https://www.designcouncil.org.uk/our-resources/the-double-diamond/

Dingemanse, K. (2015, September 8). Soorten interviews: Voor- en nadelen. https://www.scribbr.nl/onderzoeksmethoden/soorten-interviews/

Doody, B. J., Schwanen, T., Loorbach, D. A., Oxenaar, S., Arnfalk, P., Svennevik, E. M. C., Julsrud, T. E., & Farstad, E. (2022). Entering, enduring and exiting: The durability of shared mobility arrangements and habits. Mobilities, 17(4), 484–500. https://doi.org/10.1080/17450101.2021.1958365

F

Fogg, B. (2009). A behavior model for persuasive design. 1–7. https://doi.org/10.1145/1541948.1541999

Freudendal-Pedersen, M. (2016). Mobility in Daily Life: Between Freedom and Unfreedom. Routledge. https://doi.org/10.4324/9781315595764

G

Gemeente Amsterdam. (n.d.-a). Maps Amsterdam. https://maps.amsterdam.nl/

Gemeente Amsterdam. (n.d.-b). Organisatie: Hoe werkt de gemeente Amsterdam [Webpagina]. https://www.amsterdam.nl/bestuur-organisatie/organisatie/

Gemeente Amsterdam. (n.d.-c). Parkeervergunning voor bewoners [Webpagina]. https://www.amsterdam.nl/parkeren/parkeervergunning/parkeervergunning-bewoners/

Gemeente Amsterdam. (2013). MobiliteitsAanpak Amsterdam 2030. https://openresearch.amsterdam/nl/page/99028/amsterdam-aantrekkelijk-bereikbaar

Gemeente Amsterdam. (2019). Programma Smart Mobility 2019-2025. https://openresearch.amsterdam/nl/page/48272/programma-smart-mobility-2019-2025

Gemeente Amsterdam. (2020). Laad me – Strategisch plan Laadinfrastructuur 2020—2030. https://openresearch.amsterdam/nl/media/inline/2023/9/20/ams_strategisch_plan_laadinfrastructuur_enkel_def.pdf

Gemeente Amsterdam. (2021a). Hubsvisie Amsterdam. https://www.amsterdam.nl/verkeer-vervoer/hubs/

Gemeente Amsterdam. (2021b). Omgevingsvisie 2050—Een menselijke metropool. https://openresearch.amsterdam/nl/page/72317/omgevingsvisie---amsterdam-2050

Gemeente Amsterdam. (2021c, January). Monitor Autoluw Indicatoren. https://openresearch.amsterdam/image/2021/3/23/monitor_autoluw_indicatoren_2019.pdf

Gemeente Amsterdam. (2022). Handreiking deelmobiliteit en hubs in gebiedsontwikkeling. https://www.amsterdam.nl/deelvervoer/#h3f4c1b64-b6d2-40d2-a365-29a3630d5ccf

Gemeente Amsterdam. (2023). Amsterdam maakt ruimte—Koersdocument. https://www.amsterdam.nl/wonen-leefomgeving/amsterdam-maakt-ruimte/

Gemeente Amsterdam. (2024, September 10). Proefautodelen met een groep. Proefautodelen Met Een Groep. https://www.amsterdam.nl/verkeer-vervoer/deelvervoer/proef-autodelen-groep/?reload=true

Gemini. (2024, February 19). Home—Gemini. Gemini - Gemini Project. https://www.geminiproject.eu/

Google Scholar. (n.d.). https://scholar.google.com/

Goudappel. (n.d.). STOMP-principe: De mens centraal | Goudappel. https://www.goudappel.nl/nl/themas/nieuwe-mobiliteit/stomp-ordeningsprincipe

GVB. (2022). OV in Amsterdam. https://over.gvb.nl/ov-in-amsterdam/

GVB. (2024). GVB Daglijnen kaart. https://gvb.nl

H

Hardin, G. (1968). The Tragedy of the Commons: The population problem has no technical solution; it requires a fundamental extension in morality. Science, 162(3859), 1243–1248. https://doi.org/10.1126/science.162.3859.1243

Hodde, J. (2020, December 24). Warren Webinar groot succes & Opname nu online—De Warren. https://dewarren.co/archief/2020/6/12/warren-webinar-groot-succes-amp-opname-nu-online

Home—Nationaal Deelmobiliteitscongres 2024. (n.d.). https://www.nationaaldeelmobiliteitscongres.nl/

J

Jorritsma, P., Berveling, J., De Haas, M., Bakker, P., & Harms, L. (2012). Kennisinstituut voor Mobiliteitsbeleid | Mobiliteitsarmoede: Vaag begrip of concreet probleem?

Jorritsma, P., Witte, J., Alonso González, M. J., & Hamersma, M. (2021). Kennisinstituut voor Mobiliteitsbeleid | Deelauto- en deelfietsmobiliteit in Nederland.

K

Khalek, S. A., & Chakraborty, A. (2022). “I like to use but do not wish to own”: Exploring the role of de-ownership orientation in the adoption of access-based services. Journal of Retailing and Consumer Services, 67, 103035. https://doi.org/10.1016/j.jretconser.2022.103035

Krabbenborg, L., & Durand, A. (2024, August). Betaalbare mobiliteit? Kennisinstituut voor Mobiliteitsbeleid.

KTC Agency. (2023). Unlocking Deeper Insights: The Power of Need-Based Personas in Customer Profiling. https://www.ktc.agency/blogposts/unlocking-deeper-insights-the-power-of-need-based-personas-in-customer-profiling

J

Jorritsma, P., Berveling, J., De Haas, M., Bakker, P., & Harms, L. (2012). Kennisinstituut voor Mobiliteitsbeleid | Mobiliteitsarmoede: Vaag begrip of concreet probleem?

Jorritsma, P., Witte, J., Alonso González, M. J., & Hamersma, M. (2021). Kennisinstituut voor Mobiliteitsbeleid | Deelauto- en deelfietsmobiliteit in Nederland.

L

Lugt, H. van der. (2024, November 27). Bidirectioneel laden moet net gaan verlichten in Utrecht. https://energeia.nl/bidirectioneel-laden-moet-net-gaan-verlichten-in-utrecht/

M

Machado, C. A. S., De Salles Hue, N. P. M., Berssaneti, F. T., & Quintanilha, J. A. (2018). An Overview of Shared Mobility. Sustainability, 10(12), 4342. https://doi.org/10.3390/su10124342

Meer auto's maar minder per Amsterdammer | Website Onderzoek en Statistiek. (n.d.). https://onderzoek.amsterdam.nl/video/animatie-autos-in-amsterdam

Michie, S., Van Stralen, M. M., & West, R. (2011). The behaviour change wheel: A new method for characterising and designing behaviour change interventions. Implementation Science, 6(1), 42. https://doi.org/10.1186/1748-5908-6-42

N

Natuurlijk!Deelmobiliteit. (n.d.). Natuurlijk! Deelmobiliteit—Samenwerken aan toekomstbestendige deelmobiliteit. https://natuurlijkdeelmobiliteit.nl/

Mobility Strategy. (n.d.). Retrieved 20 December 2024, from https://transport.ec.europa.eu/transport-themes/mobility-strategy_en

O

Ostrom, E. (1990). Governing the Commons: The evolution of institutions for collective action.

Ostrom, E., Dietz, T., Dolsak, N., & Stern, P. C. (2002). The Drama of the Commons. National Academy Press.

P

Pasimeni, F. (2020). Modelling Fractional Ownership in the Sharing Economy.

Pasimeni, F. (2021). The origin of the sharing economy meets the legacy of fractional ownership. Journal of Cleaner Production, 319, 128614. https://doi.org/10.1016/j.jclepro.2021.128614

Paundra, J., Rook, L., Van Dalen, J., & Ketter, W. (2017). Preferences for car sharing services: Effects of instrumental attributes and psychological ownership. Journal of Environmental Psychology, 53, 121–130. https://doi.org/10.1016/j.jenvp.2017.07.003

Prognose bevolking 2024-2050 | Website Onderzoek en Statistiek. (2024). https://onderzoek.amsterdam.nl/artikel/prognose-bevolking-2024-2050

R

Rogers, E. M., Singhal, A., & Quinlan, M. M. (2008). Diffusion of Innovations. In An Integrated Approach to Communication Theory and Research (2nd ed.). Routledge.

S

Schaefers, T., Lawson, S. J., & Kukar-Kinney, M. (2016). How the burdens of ownership promote consumer usage of access-based services. Marketing Letters, 27(3), 569–577. https://doi.org/10.1007/s11002-015-9366-x

Shaheen, S., Chan, N., Bansal, A., & Cohen, A. (2015). Shared mobility: A sustainability & technologies workshop: Definitions, industry developments, and early understanding.

Simonse, L. (2018). Design Roadmapping (1e ed.).

Soza-Parra, J., & Cats, O. (2024). The role of personal motives in determining car ownership and use: A literature review. Transport Reviews, 44(3), 591–611. https://doi.org/10.1080/01441647.2023.2278445

Stappers, P. J., & Sanders, E. B. N. (2020). Convivial Toolbox (5e ed.). BIS Publishers.

Statistiek, C. B. voor de. (2022, April 6). Statusscore per wijk en buurt o.b.v. Welvaart, opleidingsniveau en arbeid [Webpagina]. https://www.cbs.nl/nl-nl/achtergrond/2022/14/statusscore-per-wijk-en-buurt-o-b-v-welvaart-opleidingsniveau-en-arbeid

T

The world's first car-sharing vehicle of Holland. (2024, February 7). https://www.louwmanmuseum.nl/en/new-in-the-collectie-the-witkar/

Townmaking. (n.d.). Townmaking. https://www.townmaking.com/

Tragedy of the Commons: Examples & Solutions | HBS Online. (2019, February 6). https://online.hbs.edu/blog/post/tragedy-of-the-commons-impact-on-sustainability-issues

V

van Boeijen, A., Daalhuizen, J., Zijlstra, J., & van der Schoor, R. (2013). Delft Design Guide (4e ed.). BIS Publishers.

van Lookeren Campagne, A. (2024). Designing for a future urban mobility system.

Vedagiri, P., & Arasan, V. T. (2009). MODELLING MODAL SHIFT DUE TO THE ENHANCED LEVEL OF BUS SERVICE. TRANSPORT, 24(2), 121–128. https://doi.org/10.3846/1648-4142.2009.24.121-128

Verplanken, B., & Wood, W. (2006). Interventions to Break and Create Consumer Habits. Journal of Public Policy & Marketing, 25(1), 90–103. https://doi.org/10.1509/jppm.25.1.90

REFERENCES
FIGURES AND TABLES

C

Caulfield, J. (2019, September 6). How to Do Thematic Analysis | Step-by-Step Guide & Examples. https://www.scribbr.com/methodology/thematic-analysis/

D

Design Council. (n.d.). The Double Diamond—Design Council. https://www.designcouncil.org.uk/our-resources/the-double-diamond/

G

Gemeente Amsterdam. (n.d.). Maps Amsterdam. https://maps.amsterdam.nl/

Gemeente Amsterdam. (2013). MobiliteitsAanpak Amsterdam 2030. https://openresearch.amsterdam/nl/page/99028/amsterdam-aantrekkelijk-bereikbaar

Gemeente Amsterdam. (2019). Programma Smart Mobility 2019-2025. https://openresearch.amsterdam/nl/page/48272/programma-smart-mobility-2019-2025

Gemeente Amsterdam. (2021, January). Monitor Autoluw Indicatoren. https://openresearch.amsterdam/image/2021/3/23/monitor_autoluw_indicatoren_2019.pdf

Gemeente Amsterdam. (2024, September 10). Proefautodelen met een groep. Proefautodelen Met Een Groep. https://www.amsterdam.nl/verkeer-vervoer/deelvervoer/proef-autodelen-groep/?reload=true

Goudappel. (n.d.). STOMP-principe: De mens centraal | Goudappel. https://www.goudappel.nl/nl/themas/nieuwe-mobiliteit/stomp-ordeningsprincipe

S

Stappers, P. J., & Sanders, E. B. N. (2020). Convivial Toolbox (5e ed.). BIS Publishers.

T

The world's first car-sharing vehicle of Holland. (2024, February 7). https://www.louwmanmuseum.nl/en/new-in-the-collectie-the-witkar/

APPENDICES

APPENDIX A - INITIAL PROJECT BRIEF 174

APPENDIX B – PREDEFINED INTERVIEW QUESTIONS 178

APPENDIX C – THEORETICAL BACKGROUND ON THE BEHAVIOUR CHANGE FRAMEWORKS 182

APPENDIX D – RESULTS OF INTERVIEWS WITH INITIATIVES 186

APPENDIX E - USER SEGMENTATION DATA 199

APPENDIX F - SURVEY 203

APPENDIX G - TOOLKITS 207

APPENDIX H - COLLECTION OF DESIGN INSIGHTS 209

APPENDIX I - STRATEGIC ROADMAP ITERATION 1 211

APPENDIX J - STRATEGIC ROADMAP ITERATION 2 213

APPENDIX A - INITIAL PROJECT BRIEF

DESIGN FOR our future

TU Delft

Personal Project Brief – IDE Master Graduation Project

Name student Babette van Lieverloo **Student number** 4,851,706

PROJECT TITLE, INTRODUCTION, PROBLEM DEFINITION and ASSIGNMENT
Complete all fields, keep information clear, specific and concise

Project title A widely adopted service design concept for Mobility as a Commons in Amsterdam

Please state the title of your graduation project (above). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

Introduction

Describe the context of your project here; What is the domain in which your project takes place? Who are the main stakeholders and what interests are at stake? Describe the opportunities (and limitations) in this domain to better serve the stakeholder interests. (max 250 words)

The need for new mobility solutions in Amsterdam is becoming increasingly pressing due to evolving urban, user, and environmental needs. Consequently, shared mobility is gaining more relevance. This suggests, as the city shifts towards shared mobility over private car ownership, that commercial shared mobility providers will shape the city's mobility. However, these commercial parties do not necessarily share the same values and goals as the city and its residents. They often prioritize profitability, which can lead to an emphasis on increasing prices. Additionally, citizens are forced to become customers of commercial providers selected by the municipality. The municipality is exploring alternatives, and one innovative concept in this field is 'Mobility as a Commons' (MaaC).

MaaC is a cooperative concept of shared mobility where citizens democratically manage and share vehicles. This cooperation allows residents to have control over various aspects such as vehicle type, usage, and costs without a profit motive. It offers citizens empowerment, as they are in charge of their own mobility arrangements. The goal of MaaC is to reduce the number of cars in the streets, freeing up space for other purposes and contributing to community engagement, while being independent.

The main stakeholders involved in this project are the municipality of Amsterdam and its citizens, both as users and non-users benefiting from independence and improved urban space. The partner for this project is Gemeente Amsterdam - Smart Mobility Programma. This team is committed to the city's accessibility while also ensuring its livability.

MaaC is still to be further developed. Opportunities for successful implementation lie within exploring potential user groups. The main challenge of the project will be to target a broad user group and explore their needs while also taking the interest and legal regulations of the Municipality of Amsterdam, as well as technological possibilities into account to ensure that the results are feasible, viable and desirable.

→ *space available for images / figures on next page*

introduction (continued): space for images

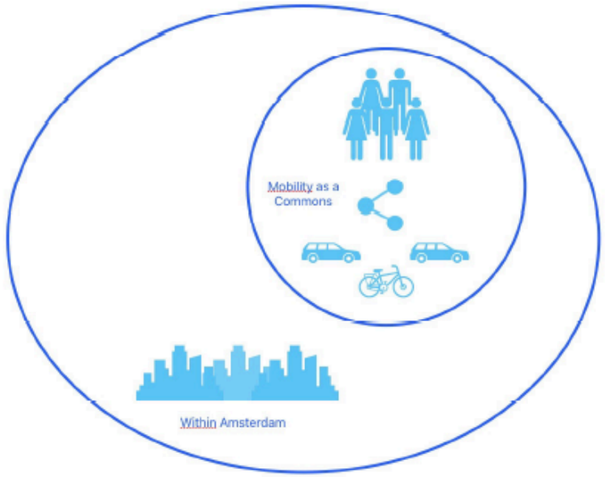


image / figure 1 The scope of the project

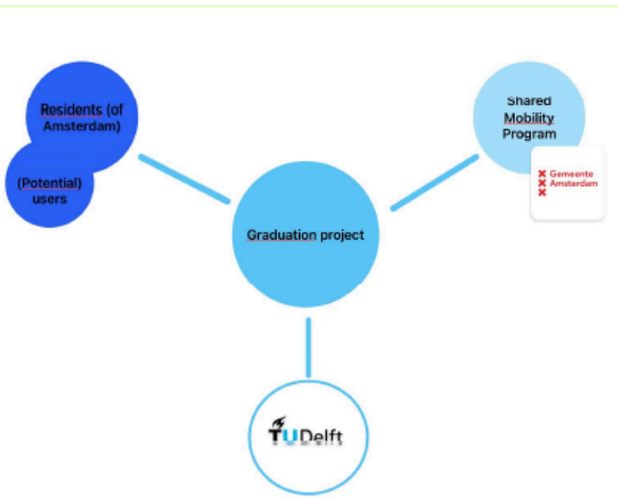


image / figure 2 Currently known stakeholders

DESIGN FOR our future

TU Delft

Personal Project Brief – IDE Master Graduation Project

Problem Definition

What problem do you want to solve in the context described in the introduction, and within the available time frame of 100 working days? (= Master Graduation Project of 30 EC). What opportunities do you see to create added value for the described stakeholders? Substantiate your choice.
(max 200 words)

The current concept of MaaC is primarily designed from a practical standpoint, focusing on logistical elements such as insurance, permits, and parking. However, successful integration of MaaC necessitates a step towards human-centric design. Understanding and addressing needs and preferences is important for the transition from private mobility to MaaC. Currently, because of the way it is designed, the main user group acts from an idealistic perspective, is highly motivated and organizes their own cooperation independently. While the concept has the potential to fit a broad range of citizens, the challenge lies in reaching these groups.

This project aims to determine if MaaC is a viable solution for the city, and if so, what adjustments are needed to make it accessible and appealing to a broader user group within Amsterdam. The knowledge gap is bridged by identifying potential user groups, their mobility needs, and barriers to adoption, and exploring how to reach them.

This project focuses on exploring the context of MaaC, with a focus on its application within the city and mobility system of Amsterdam and its citizens.

Assignment

This is the most important part of the project brief because it will give a clear direction of what you are heading for. Formulate an assignment to yourself regarding what you expect to deliver as result at the end of your project. (1 sentence) As you graduate as an industrial design engineer, your assignment will start with a verb (Design/Investigate/Validate/Create), and you may use the green text format:

Create a service design for Mobility as a Commons that is widely adopted by citizens in Amsterdam

Then explain your project approach to carrying out your graduation project and what research and design methods you plan to use to generate your design solution (max 150 words)

The assignment will be reached by investigating how MaaC can appeal to a broader user base by gaining insights into the needs, preferences, and barriers of different groups.

The 5 phases of the project:
Phase 1 - Discover & Define: It shall be focussed on discovering the context and defining the problem and design goal.
→ After phase 1 a brainstorm session on deliverables with municipality team
Phase 2 - User research & Define: It shall be focussed on discovering the potential user groups by performing multiple methods of user research. Personas, use cases and customer journey mapping will be used as methods to get a clear view on needs & preferences.
→ After phase 2 determine and decide on deliverables & further define next phases
Phase 3 - Design: Co-creation sessions with potential users will be held to get insights in how they would design the service.
Phase 4 - Evaluation: It shall be focussed on evaluation. Feedback sessions with stakeholders, experts and users will be performed to gain insights and iteration steps.
Phase 5 - Finalisation: preparing the final deliverables.

Project planning and key moments

To make visible how you plan to spend your time, you must make a planning for the full project. You are advised to use a Gantt chart format to show the different phases of your project, deliverables you have in mind, meetings and in-between deadlines. Keep in mind that all activities should fit within the given run time of 100 working days. Your planning should include a ***kick-off meeting, mid-term evaluation meeting, green light meeting*** *and* ***graduation ceremony****. Please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any (for instance because of holidays or parallel course activities).*

Make sure to attach the full plan to this project brief.
The four key moment dates must be filled in below

Kick off meeting	6 sept 2024
Mid-term evaluation	22 okt 2024
Green light meeting	10 jan 2025
Graduation ceremony	7 feb 2025

In exceptional cases (part of) the Graduation Project may need to be scheduled part-time. Indicate here if such applies to your project

Part of project scheduled part-time	
For how many project weeks	20
Number of project days per week	5,0

Comments:
I will be working on the project full-time, with a two week break during the christmas holiday.

Motivation and personal ambitions

Explain why you wish to start this project, what competencies you want to prove or develop (e.g. competencies acquired in your MSc programme, electives, extra-curricular activities or other).

Optionally, describe whether you have some personal learning ambitions which you explicitly want to address in this project, on top of the learning objectives of the Graduation Project itself. You might think of e.g. acquiring in depth knowledge on a specific subject, broadening your competencies or experimenting with a specific tool or methodology. Personal learning ambitions are limited to a maximum number of five.
(200 words max)

My interest for the dynamic world of innovative and sustainable mobility has been growing increasingly in the past years. I am convinced that mobility must evolve to enhance sustainability and urban livability. This transformation presents many challenges. The city of Amsterdam offers a unique and exciting environment for this challenge. In the future I would want to contribute to improving and developing innovative, sustainable mobility solutions. This project is the perfect opportunity to explore this interest.

Personal goals
Develop strategic thinking: During my master's degree I have missed the aspect of strategy in the projects. This project is the opportunity for me to develop my strategic skills.

Explore the work environment of a municipality: I believe the mindset of a municipality differs significantly from that of commercial parties. Municipalities are not profit-driven; instead, they focus on addressing social issues. I am excited to learn the way of thinking and designing from a social perspective rather than commercial.

Improve user research skills: As a designer with a focus on user-experience, I recognize the importance of engaging with users for research. I am keen to explore different user research techniques, such as organising a co-creation session.

APPENDIX B – PREDEFINED INTERVIEW QUESTIONS

Expert interview

Introduction:
Welcome! Thank you for taking the time to do this interview.

I would like to learn more about Commons through this interview, which is why I contacted you. I would like to shape the interview through a number of pre-determined questions, feel free to join in or ask questions at any time. There are no wrong or bad answers.

My first question is whether you would like to remain anonymous? If you wish to remain anonymous, your name or other contact details will not be mentioned in documentation and the final report.

Then my second question is whether it is okay if the interview is recorded. The recording will only be listened to again by me to transcribe and will be deleted after the end of the project.

Do you have any questions?

Introduction
• Can you tell us something about yourself and your involvement in the Commons theme?

Theme 1: Urban Mobility
• What do you see as the biggest challenges in the field of urban mobility, for example in a city like Amsterdam?
• How do you think mobility in cities will develop in the future?
• What role could shared mobility play in this, do you think?

Theme 2: Commons
• How would you describe the concept of "Commons"?
• What factors do you think are important for the success of a Commons model?
• What obstacles might arise when setting up or maintaining a Commons model?

Theme 3: Commons in Mobility
• How would you describe the differences between cooperative mobility sharing and commercial mobility services?
• What do you think cooperative sharing could contribute to urban issues? Such as the accessibility of mobility? The costs of mobility?

• Which technological developments do you see as important for the development of cooperative sharing?
• What do you think the role of government or other public bodies could be in supporting a Commons-based mobility model?

Theme 4: Users and Acceptance
• What could motivate people to choose cooperative sharing?
• What could be the possible barriers for people to choose this form of mobility sharing?
• How do you think different target groups can be involved or reached in a Commons model for mobility?
• What do you see as the biggest challenges in scaling up cooperative mobility solutions?

Closure
• Do you have any tips or recommendations for designers, policy makers or researchers working on cooperative mobility solutions?
• Is there anything else you would like to add or share?

Thank you very much for your time and your valuable input!

Would you perhaps be open to discussing the results of this research for feedback at the end of my project?

Initiatives interview

Introduction:
Welcome! Thank you for taking the time to do this interview.

Through this interview I would like to learn more about MaaC, which is why I contacted you. I would like to shape the interview through a number of pre-determined questions, feel free to join in or ask questions at any time. There are no wrong or bad answers.

My first question is whether you would like to remain anonymous? If you wish to remain anonymous, your name or other contact details will not be mentioned in documentation and the final report.

Then my second question is whether it is okay if the interview is recorded. The recording will only be listened to again by me to transcribe and will be deleted after the end of the project.

Do you have any questions?

Introduction
• Would you like to briefly introduce yourself and tell us something about your involvement in the subgroup?

Theme 1: General
• Can you tell us something about how you came into contact with this method of car sharing?
• Can you tell us something about how your car sharing group came about and what your experience is with how it is developing?
• Can you tell us something about how your car sharing group works together and shares cars? For example, how do you reserve cars?

Theme 2: Motivation
• What was the most important reason(s) for you to start car sharing? And for this shape?
• Have you previously used your own car or other transportation options? What was the deciding factor for switching to car sharing?

Theme 3: Positive experiences and benefits
• What benefits do you personally experience from sharing a car in this (cooperative) form?
• How does this differ for you from owning a private car or other forms of car sharing?

Theme 4: Challenges and obstacles
• Can you share any challenges you have encountered since participating in this subset?
• Can you tell us something about your experiences with working with other participants within the subgroup?
• Have there been times when you have had less positive experiences? If so, may I ask what happened? What would you rather have seen differently in those situations?

Closure
• Is there anything we haven't covered yet that you would like to share?
• If you could give one tip or idea about how this form of car sharing could be made possible for people, what would it be?

Thank you very much for your time and your valuable input!

Would you perhaps be open to discussing the results of this research for feedback at the end of my project?

APPENDIX C – THEORETICAL BACKGROUND ON THE BEHAVIOUR CHANGE FRAMEWORKS

Diffusion of innovation

A widely cited theory on consumer adoption of new innovations is the Diffusion of Innovation theory (Rogers et al., 2008). The process is mapped out by a bell curve that visualises the stages of adoption of a new innovation. Rogers has established five categories of adopters: innovators, early adopters, early majority, late majority, and laggards.

The **innovators** are eager to be the first embrace new innovations and willing to explore (2.5%).
The **early adopters** are the next group after the innovators have embraced an innovation, they form a key group because they are the opinion leaders and serve as the inspiration for the next group. This group is willing to put time and energy into embracing an innovation (13.5).
The **early majority** is the group that is interested in the innovation yet is cautious of embracing it. They tend to wait until the rocky roads have been explored and the innovation is fully embraced and promoted by the previous groups (34%).
The **late majority** is the group that will only embrace the innovation when vast of the majority already has and the innovation is established in the social norm (34%).
The **laggards** are a group that dislike change and value tradition. They will only adopt an innovation when they can no longer avoid it (16%).

According to the model, any new innovation is first adopted by the innovators and then followed by the early adopters. The success of an innovation lies within overcoming the threshold between the early adopters and the early majority, this determines the success of an innovation. A mobility-related example is the first users of electric vehicles (EVs). These users wanted access to the first commercially available EV models despite limited charging infrastructure and excessive costs. Their enthusiasm and public promotion for EVs contributed to the normalization of EVs and encouraged broader adoption as the technology, prices and charging infrastructure improved.

The theory is a powerful tool for understanding how new innovations spread throughout society. It can be used to identify the key groups, innovators and early adopters, whose enthusiasm can drive broader acceptance of innovations. The theory can provide insights into how to accelerate the adoption of innovations and encourage behavioural change.

According to Rogers' theory, there are five attributes that impact the adoption of an innovation (Rogers et al., 2008).

- Relative advantage: is the innovation better than what it is replacing?
- Compatibility: does the innovation recognisably build on what came before? Can I understand it?
- Complexity: is it easy to use?
- Trialability: can I experiment with it?
- Observability: are the result of this innovation clear for all to see?

The S-frame and I-frame

Historically, behaviour change frameworks have been targeted at individual-level due to the primary focus on health, such as encouraging patients to stick to their medication schedules. However, a group-oriented approach has only gained interest in the past thirty years, which is therefore less extensively researched. Understanding behaviour change in both individual and group context is essential, as transitions require shifts at the individual and collective level (Trend Team, 2024).

Overall, behaviour change interventions can be categorised into two frameworks: individual-focused (I-frame) and system-focused (S-frame, group) (Chater & Loewenstein, 2023).

- **I-frame**: an individual-oriented intervention focussed on individual responsibility. The individual is free to do whatever with the information. An example of such are the campaigns promoting the benefits of car sharing over private car ownership. The individual's responsibility and experience are targeted, yet the individual can still choose to do with the information however they want.
- **S-frame:** a system change intervention to make other choices more appealing or obligated. An example of such an intervention is the speed limit of thirty kilometres per hour in Amsterdam. The individuals are obligated to show a behaviour due to systematic regulation otherwise they might get fined.

Both frameworks show the importance of balancing individual and systemic approaches. While I-frame interventions raise awareness and inform personal decisions, they are often insufficient on their own because the broader system still supports the status quo. Systemic changes, S-frame, are essential to reshape the environment in ways that motivate and sustain behaviour change on a larger scale. Together, these approaches highlight the need for comprehensive strategies that address both individual and systemic barriers to change.

The COM-B Model

The COM-B model is a behaviour change framework which proposes that the following three components will determine whether a certain behaviour (B) will occur: capability (C), opportunity (O) and motivation (M). These components give an understanding how and when behaviour change occurs and how to design behaviour change interventions (Michie et al., 2011; Trend Team, 2024).

Capability refers to whether people can engage in the desired behaviour.

- Physical: is the person physically able to.
- Psychological: is the person mentally able to.
- Financial: is the person financially able to.

Opportunity refers to whether the circumstances allow for the desired behaviour.

- Physical: this concerns opportunities such as availability to public transport and digital platforms.
- Social: the cultural and social norms affect desired behaviour. For example, the perception of the car in a culture impacts behaviour.

Motivation refers to the internal state that influence whether the desired behaviour is performed. This component is crucial yet challenging to influence.

- Unconscious: influenced by beliefs and experiences.
- Reflective: people are aware of these motivations.

The framework seems to suggest that all three factors have an equal importance and effect. In the real-world, it depends on the context which factors have more importance than the others. For example, the social norm opportunity may overpower motivation in the mobility transition, as in society private car ownership is still the standard (Trend Team, 2024).
From a municipal point of view, it should be considered what would be the most effective use of methods as it depends on the type of transition and context. Besides, it should also be considered in which phase of the transition is acted. Look at the mobility transition for example, specifically at shared mobility, the best the Municipality can do at this stage is creating physical opportunity as first residents should be able to show a certain behaviour (Trend Team, 2024).

An example approach, aimed at the social opportunity, which is known to be effective is moralising behaviour which is a long-term process. An example is the transition of smoking. A social stigma was successfully created around smoking, which encouraged widespread behaviour change. Comparing this to mobility, it could mean that promoting a cultural shift away from car ownership as the norm, gradually making car sharing a more socially accepted or desirable option, could be effective (Trend Team, 2024).

The Fogg Behaviour Model

Another widely cited theory on behaviour change is the Fogg's behaviour model by Dr BJ Fogg (Fogg, 2009). The model provides insights into behaviour through three drivers: motivation, ability, and prompts. The model states that for a person to perform a behaviour, they must be motivated, be able to perform the behaviour and be triggered by a prompt to show the behaviour. It emphasises the importance of a prompt when aiming for a behaviour change, not merely focus on motivation and ability. The action line shows the activation threshold: when the combination of motivation and ability of the person is above the threshold, then a prompt will be successful. One essential element besides these three drivers, is timing. According to Fogg, the timing is whenever an individual is above the threshold.

APPENDIX D – RESULTS OF INTERVIEWS WITH INITIATIVES

The Hague

A MaaC initiative from The Hague, part of WijZijnDeel, was explored through interviews with two members. One founded the initiative and provided insights into the organisational perspective, while the other shared perspective as a new member. The initiative was guided by the cooperation WijZijnDeel. WijZijnDeel is a cooperative organization that actively guides and supports MaaC cooperations. The founder of WijZijnDeel acts as a stakeholder in the GEMINI project under the organisation Townmaking.

MaaC initiative and roles
The initiative established in 2020 and consists of approximately fifty active households, who collectively share seven electrics cars. The organisation is structured by distinct roles and responsibilities, including a board, a members' council, fan clubs and various committees. Generally speaking, there are two types of members: those driven by idealistic motivation and those who approach it more from a consumer-minded perspective.

Vehicles and use system
The cars each have a parking permit for the neighbourhood with a designated parking spot and charging station. Each car is leased, which holds a lower financial risk than buying as the initiative must pay a fixed monthly cost which includes costs such as maintenance and insurance. The app and keyless system provided by 'OnzeAuto' is used to manage the bookings and cars. A new car is only introduced when it is suitable for demand to ensure it is used efficiently. This strategy prevents underutilization of vehicles.

OnzeAuto is a semi-commercial organisation that provides car sharing in a closed group. OnzeAuto takes upon all organisational aspects and groups can share vehicles by each paying a subscription to OnzeAuto.

The initiative has an account for MyWheels which members can use as back-up in case all cooperative vehicles are unavailable. This is merely a tool to decrease availability anxiety, it is not often needed. MyWheels is a commercial car sharing platform.

Recruitment and onboarding
New members are recruited through flyers, advertisements in a local newspaper and information sessions. Potential members can apply via email or WhatsApp.
The active onboarding with a board member starts with a phone conversation to explain the initiative's values and responsibilities, ensuring that the new member understands what it

means to be part of it. For the first time use, a meeting is planned for a firsthand instruction on how to operate the app and system.

Finances
A calculation tool by WijZijnDeel is provided to estimate expected usage of new members, which determines initial financial contribution. Monthly bills consist of a fixed price and usage based on booked hours and kilometres driven.
Due to the non-profit character, the prices fluctuate based on vehicle use. If they are underutilized, it can lead to an increase in price. In case of frequent use, money can be distributed, or the price can be reduced.

Communication
Communication is facilitated through an active WhatsApp community group with different chat groups. There are two obligated groups: one for board announcements and one for general announcements. In the chat, members actively encourage considerate use of the cars. Additional chat groups are created based on specific roles or needs, such as fan-club group chat. The initiative aims to go beyond mobility sharing, therefor they also have a chat group for sharing other resources.

The Hague 2

Another MaaC initiative from The Hague is explored, which is also part of WijZijnDeel. The founder of both this initiative and WijZijnDeel was interviewed.

MaaC initiative and roles
The founder started the group in 2019, which currently consists of approximately ninety-five households who share sixteen electrics cars, each with a designated parking spot. The organisation of the initiative is similar to the other The Hague initiative. The group is distributed over two neighbourhoods, the board and council are fifty-fifty divided including residents from both neighbourhoods.

Multiple members taken upon the previous mentioned role of ‘consumers.’ Often when members want to be active, they will step forward and take on a citizen role as the interviewee called it. The initiative values involvement as it is not merely a service provider. The scale of the initiative provides for more certainty in availability and a big turnover per year. The downside is the increase of anonymity in the community. To create more bonding between members, the organisation is looking into organising events for bonding in smaller groups. Once a year they aim to organise something for the entire cooperation. The aim is to grow ten times as big, complementing the vision of the Municipality of The Hague to have two

shared cars per street.

The initiative is often invited by the Municipality to discuss different themes that are of topic in the neighbourhood.

Recruitment
Recruitment of new potential members happens through flyers, word of mouth and information session.

Finances
It makes turn over every year. Due to the non-profit character this money is either deducted to members or can be used for other purposes. The interviewee sees possibilities of eventually creating jobs for the community.
Members pay a monthly contribution and for use in kilometres and hours, a so-called a distribution key rather than a price set. There are possibilities to give certain members discount due to personal challenges, such as job loss and car need for job applications.

Amsterdam

A founder of an initiative from Amsterdam was interviewed. This initiative is part of the ‘Proef autodelen met een groep’ and is therefore guided by WijZijnDeel.

MaaC initiatives and roles
The initiative, founded in 2022, consists of fifteen household which collectively own two cars, each with a designated parking spot in the neighbourhood. Additionally, the initiative has two extra designated spots with a charging station.

The organisation is similarly structured as the previous two. Twice a year, a general members meeting is organised. Important decisions are made by consensus of all members. This approach aims to ensure that there is no minority who feels like they are not listened to or missing out.

In a small initiative the workload is carried by less. If the initiatives scale up, more members can carry responsibilities which reduces the burden on a small group of members. This interviewee also mentioned the general distinction between two types of members.

Vehicles and use system.
Both cars are leased and equipped with the operational system of OnzeAuto. The app is used to manage vehicles and register damages. The app also serves as the back office for WijZijnDeel to generate the monthly bills per member.

Due to the scale of the cooperation, it is more vulnerable to unavailable or damaged cars. To ensure members have access to a car, there is also an account for MyWheels as back-up. The vehicle can be booked according to the initiatives price model.

Recruitment
For expansion of the cooperation, new members are recruited through handing out flyers and posters in the neighbourhood. As the initiative grows the recruitment also spreads by word of mouth, which is highly effective.

Finances
The costs are shared among all members which need to be covered by vehicle use. Every quarter there is an assessment on the costs and the revenues of the trips, based on the assessment members must pay extra or receive a refund.
The monthly financial overview is generated by WijZijnDeel, using the data from the app to calculate the costs per member according to their use and the price model. For this service, a monthly fee of twenty-five euros per car and an annual fee is paid to WijZijnDeel.

Communication
A WhatsApp group chat is used for communication. Members can communicate with each other daily, typically messages include board announcements or general announcements about the vehicles.

Leiden

A board member, who was part of the foundation, from a small initiative in Leiden was interviewed. This initiative founded itself and learned by doing.

Initiative and roles
It was founded in 2019 and currently consists of fifteen members who share four vehicles. The founders were motivated by the following three goals: sustainable mobility, less cars on the streets and social cohesion in the neighbourhood. The group set a maximum capacity of eighteen members to maintain social cohesion and prevent anonymity.

The initiative is organised by a board of three members, who meet multiple times a year and organise one general member meeting each year. Members take on a diversity of roles, such as the organisation of finances or the design of recruitment flyers. Each vehicle has a personal ambassador who takes on are little extra responsibility.

The initiative has an excluded liability (EL). Which means that in case of financial problems or bankruptcy, members are not legally responsible. The EL has a certain appeal as it decreases

risks, limits responsibility and impact on members.

The members are very transparent about their knowledge and work closely with the Municipality of Leiden. Interested individuals or groups are welcome to participate and learn from the initiative's experiences.

Vehicles and roles
Of the four vehicles, three have parking permits of which one has a designated parking spot. One vehicle is a small city car that does not require a permit. Two cars are electric, and two run on green gas, which is chosen for its flexibility compared to electric due to shorter refuelling times. Three of the cars are leased, while one second-hand car was bought using a loan from members who contributed funds. Over five years, these members are repaid with interest. The desire to share beyond vehicles is expressed.

To manage vehicles the app of Klender used, of which the monthly fee is one euro. Klender is an app for shared calendars, not particularly focussed on mobility.

Recruitment and onboarding
For recruitment, the initiative depends on the stick-together-effect. Through word of mouth more residents of the neighbourhood gain knowledge and apply to join. Separately, flyers and articles in local newspapers has also been used.

The initiative depends highly on trust between its members, therefor decisions about accepting new applicants are made collectively by the group. To join, new members are required to waive their parking permit; however, to ease this transition, the Municipality reserves their permit for the first two years. If members decide that the initiative is not a good fit, they can easily reclaim their permit.

The costs
At the start, the initiative received a three-thousand-euro subsidy from the Municipality to fund recruitment materials and down payment for the lease. All operations are organised independently, without involvement from (semi-) commercial parties except for the app, so funds stay within the cooperation.
Finances are managed through a spreadsheet. Members record mileage in the app after each trip, this data is used to estimate the driven kilometres. Combined with the used hours, a monthly invoice is generated for each member based on agreed rates per kilometre and hour.

Communication
Signal is used to communicate within the cooperation.

Hilversum

A cooperation was explored, an active member was interviewed.

Cooperation and organisation
The cooperation with three hundred and fifty household has the aim to reduce their carbon emissions which is their driving motivation.
Due to the large scale of the cooperation, the organisation is divided into a paid operational coordination and volunteers.

Vehicles and use system.
The members share thirteen leased electric vehicles which are placed based on demand. The exploration to cargo bikes was unsuccessful.

For charging public charging stations are used. The bidirectional charging is the goal and will transform cars into driving batteries. The cars can store and drive on solar energy, when needed the solar energy can be used by members, a multipurpose sustainable vehicle. The cooperation is working closely with educational institutions to explore the potential of bidirectional charging in community projects.

To manage the vehicles, the system of the cooperation The Mobility Factory Europe (TMF) is used. A cooperative organisation that offers a platform for sharing vehicles with multiple users (The Mobility Factory | A European Network of Local, Sustainable Mobility Cooperatives, n.d.).

Recruitment
The cooperation spreads knowledge and recruits through multiple platforms and activities. A local newspaper, promotion in shopping areas, social media, and flyers.

Finances
The cooperation's finances are structured in subscription, which are based on the quantity of use, ranging from low to intensive use. The price, which includes a fixed and use fee, vary per tariff. The subscription should fit the diverse needs of members. For example, the highest tariff should make intensive use more attractive to fit commuting needs. To protect the cooperation from unexpected costs a safeguard system is used. Members, depending on their chosen tariff, either contribute to cover a loss or receive a share of the profits.

For the foundation of the mobility aspect of the cooperation, it received a starting subsidy for three years for the Municipality.

MobiGo

A board member of MobiGo, a car-sharing organisation, was interviewed. It was founded in 2017 in Zeist, motivated by the climate vision of the Municipality. Initially, it started with sharing cargo bikes. Later, it expanded to include cars which inspired the founding of MobiCoop, the cooperation responsible for all organisation and finances. There is MobiGo which is the overarching organisation, and the MobiCoop is the cooperation within.

Organisation and roles
MobiGo is active in approximately thirty-five neighbourhoods spread over twenty municipalities with each neighbourhood ensuring local management. Each neighbourhood has ambassadors who are responsible for new members and maintaining the vehicles.
MobiGo members can be divided into the ones that are part of the cooperation and those who are not. A benefit from this deviation, is that people who do not have the financial ability to contribute to a cooperation, do have the ability to join car sharing and benefit from it.
MobiGo actively performs studies on their impact. Results show that the number of cars has been reduced and driven kilometres per member have decreased by twenty to twenty-five percent. The research also shows that members consider their mobility differently and choose active mobility more often.

Vehicles and use system.
Among MobiGo, eighty vehicles are shared. All vehicles, placed on demand, are electric and have designated parking spots with charging stations. To avoid monopolizing public chargers, they only assign one shared car per charging station. This approach also ensures wide distribution of vehicles across neighbourhoods. MobiGo offers special-use vehicles, such as pet-friendly and child-friendly options.
The use of vehicles is managed by the platform WeGo Carsharing, which also takes care of the finances and invoices. WeGo is a platform for managing shared vehicles with multiple users.

Recruitment and onboarding
After application, a meeting is planned with an active member to ensure a good knowledge transfer and reduce anonymity. Via municipalities, via the website or via word to mouth MobiGo recruits' members. MobiGo also organizes ´boarding days´, where potential members can try out the shared vehicles, meet other members, and ask questions. This provides a low effort way for people to get acquainted with MobiGo.

Finances
The monthly costs are based on a subscription and a use fee based on kilometres and hours. Revenue generated is reinvested back into the cooperation.

Haarlem

The coordinator, also the initiative taker to start, of a car sharing pilot in Haarlem was interviewed. The interviewee is also part of 'Natuurlijk!Deelmobiliteit' (see section X) to gain a better understanding of car sharing with a group and the role of municipalities.

Initiative and roles.
The initiative of sharing started in 2016 with the motivation to drive electric, which shared commercial parties did not offer yet. In 2019 the sharing pilot officially started with the aim to explore cooperative sharing. A resident association was formed with approximately one hundred and twenty-five members. The association worked together with an implementation organisation that thrives for a sustainable living environment. The goal was to become a cooperation after the pilot had finished, which would have been partly owned by the organisation and partly by the resident's association. The role of the organisation was to spread the cooperation from one neighbourhood, utilizing the strength and knowledge of the organisation to work at city level. Unfortunately, the pilot ended with a negative result.

In the association around ten to twenty percent took on an active role. As the association was not a cooperation yet, there was no official board. One of the roles mentioned is cleaning, which was exchanged for free driving minutes. The association showed the potential in flexibility of cooperative sharing. One member, who had to commute to work every working day, had a special arrangement. To be certain of availability one car was booked for him every working day. It was an exploration whether it could be possible to have different arrangements for unique needs.

Vehicles and use system.
The association shared six vehicles at its peak. To manage the vehicles the platform of WeGo Carsharing was used, the aim was to use the cooperative software of TMF.

Finances
The business case of the association showed that when more is done cooperatively the business case becomes more attractive as costs decrease.

Communication
Via a chat group, platform unknown, the association communicated with each other. One of the benefits promoted by the interviewee was that members were able to asks for a vehicle when they were all rented in case someone really needed a vehicle which resulted in higher occupancy rates.

Collection of key elements

Valuable key elements learned from these cooperations for the success of cooperative sharing:
- Availability, easy accessibility, and well-maintenance of cars.
- Trust between members.
- Public transport accessibility, alternatives to driving.
- Starting with a minimum of four cars and twenty households to avoid vulnerability to car failure.
- Enjoyable collaboration between members.
- Experienced guidance and support for founding the cooperation.
- Financial accessibility at the start.
- A healthy scale of twenty-five to fifty households. A larger cooperation benefits from greater flexibility when one car is unavailable, as the demand can be managed by the other vehicles.
- A sense of ownership, so members feel responsible for the cars.
- Designated parking spots with consistent costs.
- Everybody should be equal, feel like the car is their own.
- A mix of people and different mobility needs.
- People in the cooperation should know each other.
- A minimum use of the vehicles to ensure income to pay for the lease.
- Critical mass for a vehicle
- A vehicle should be owned by all, and not a personal vehicle that is available for the cooperation
- Offer a trial period for residents to explore and experiment with cooperative sharing without too much risk.
- There needs to be a certain involvement, a certain professionalism to run this specific organisation
- A high density, to offer the same sense of freedom as a private car
- First phase, financial support for the founding
- It is a bottom up initiative and should remain that way, residents should inspire other residents.
- Access to good public transport is key to have an alternative to cars.
- Money for foundation from city

Collection of benefits

- Convenience for members, only pay for use.
- Financial advantages compared to mobility options.
- Transparency into costs encourages a decrease in car use.
- Unavailability and transparency into costs encourages use of other mobility options.
- Offers mobility to those who cannot afford private ownership.
- Could be part of solution for mobility challenges in urban areas.
- Access to new, electrics cars.
- Good option when public transport is limited.
- Cars are used more efficiently than private cars.
- Members feel responsible for the cars as cars feel like their own.
- More dependable than commercial, as the cars are placed to fit demand.
- Less metal on the streets
- A fixed parking spot
- More conscious use of mobility
- Low costs
- Contributes to community and social experience of the neighbourhood
- Lower costs than private car
- Less cars so less CO2
- Less cars on the street
- Less anonymous than commercial sharing
- It is very valuable for people with a smaller income, that is an easy calculation.
- It creates space in the neighbourhood.
- It can create a local budget for the neighbourhood.
- A larger scale can help distribution to others neighbourhoods and support founding cooperations.
- Rethinking of mobility due the cooperation; making more sustainable choices in mobility.
- Less trips for short distances
- More social cohesion
- Lower prices
- In case of a cooperation, different needs can be met as arrangements can be made in the group as a result of being in charge of everything.
- There are multiple ways to organise and share cars, if promoted residents can choose and decide themselves which fits best with their needs and income.
- The bigger the scale, the more flexibility can be offered and the more impact can be made.
- Members consider their mobility differently.
- It makes the costs of a car insightful; more like buying a train ticket. The user knows what to expect when he makes a trip.
- Members do not buy new cars or get rid of their second car

Collection of challenges

- Accounting for parking and charging costs when calculating price model.
- Slow growth, which can limit resources and organisational distribution.
- Access to charging facilities in neighbourhood or at designated parking spot.
- Navigating policy related to cooperative sharing.
- Important messages can get lost in the group chat among other messages.
- A goal for the future is to maintain their own app and keyless system, reducing dependency on external providers.
- Considerable time, effort, guidance, and funding needed to establish the cooperation.
- Limited flexibility compared to owning a private car.
- Scale of the cooperation: too small can cause vulnerability and high dependency on small group, while too big can cause friction and anonymity.
- Guarantee of car availability.
- Splitting big groups means that more people with motivation and time are needed for organisation.
- Finding people that want to actively contribute.
- There is balance in turnover; as a cooperation you do not want to pay taxes on the turnover yet the bills have to be paid. At the end of the line, the balance should be 0. The financials costs of the founding of a cooperation.
- The social construct asks a lot of people
- Bondings in larger cooperations; people do not know each other anymore
- Preventing consumer behaviour such as complaining if something doesn't work
- Fear and unknown
- Different charging rates at different stations.
- Many people are unaware of the true financial costs of owning a private car, making it harder to recognize the potential savings of shared mobility.
- In some cultural groups, cars are seen as status symbols, complicating the appeal of shared mobility.
- There is skepticism about why municipalities would allocate parking spots to cooperatives when so many residents are already vying for them.
- Municipalities often work at a slower pace than cooperatives would like, creating frustration.
- Establishing a cooperative can be a complex process.
- The car is a very private possession of people.
- Finding new neighbourhoods takes a lot of time
- Missing policy in municipalities
- Financing new cars as lease companies want ensurance.
- Small villages with lack of good PT
- It is noticed that municipalities are afraid of misusage and lack trust in the residents. The

· founder stressed that the way this form of sharing is set up, decreases the chances of misusage as people do it collectively.
· Cooperative sharing is not a blue print, everyone has to figure out themselves how to organise. Yet there are working principle which can be turned into an overview to help the foundation.
· The role of the car in cultures has an effect of how PT or shared mobility is viewed.
· Anonymous in larger scale cooperations, people take less care of the vehicles
· Working platform and use system
· The availability of charging stations
· The effort and time organisation takes.
· Placing charging stations for cooperation as the city wants the stations to also be available for the public.
· Unfamilairity
· Psychology of private car ownership
· Fear of unavailability for spontaneous use
· Charging construction
· Costs sensitive users; competing with the prices of commercial parties
· Insurance for shared vehicles; as a cooperation difficult to buy a vehicle
· Not a lot of charging stations
· Having to lease instead of own, it increases the costs

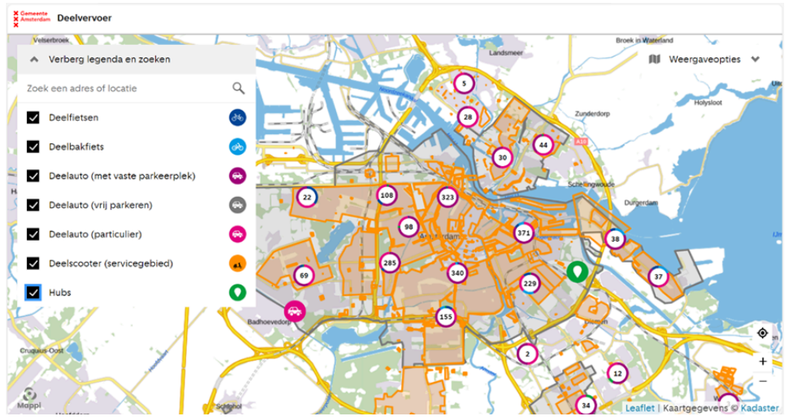
Collection of barriers

· Inconvenience compared to private ownership.
· Limited spontaneous use.
· Effort to organise and maintain cooperation, particularly in the initial stages.
· The freedom is different than that of a private car
· Availability of cars
· Need of a car during times when no PT is available, high dependency on cars
· The attitude of the city towards the group, there should be a level of respect and understanding.
· Paying for the cars when they are standing still; for example when needed for work it stands still the entire day, this results in paying for the car when not using it.
· Unfamilairty
· Private ownership

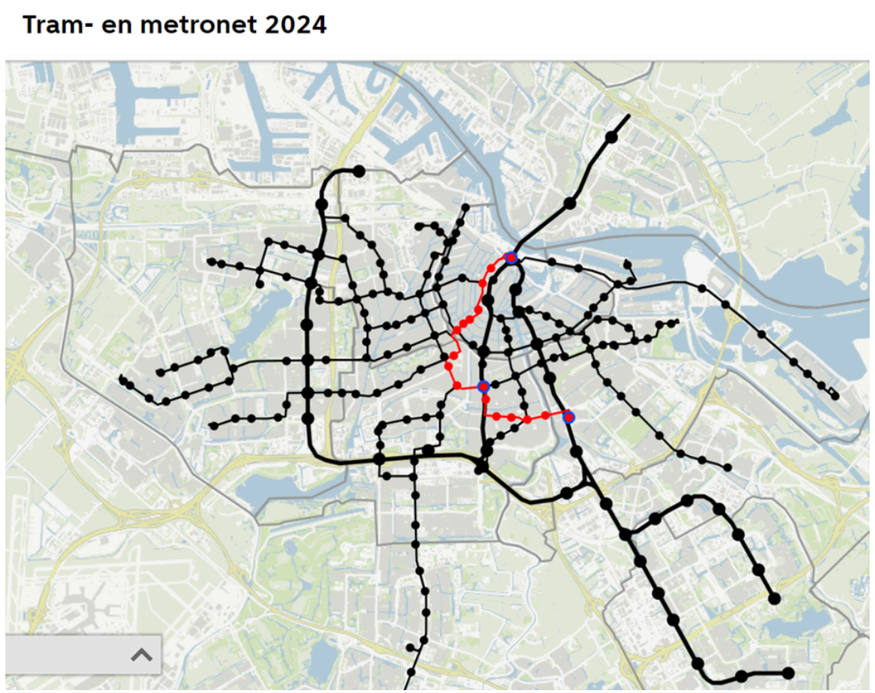
Collection of motivations

· Low car use needs
· Access to new and electric cars
· Sustainability ambitions
· Designated parking spots
· Affordable costs (lower than private, shared or even PT)
· Social and community aspects (having fun and bonding with neighbours)
· Exploring alternatives to private ownership
· Reducing unused cars to free up space
· Lack of available or affordable parking.
· Building a car-sharing community for the neighbourhood.
· Anticipating parking shortages in the area.
· Desire to contribute to a positive social or environmental cause.
· Low personal car usage.
· Frustration with crowded streets due to excessive car ownership.
· Interest in sustainability.
· Lack of attachment to private car ownership.
· A designated parking spot
· Social revenue
· It is fun to do it with each other and the neighbourhood
· Because it is a cooperation, the money comes back to the cooperation
· Electric vehicles for sustainability
· Do not want to buy a new car
· Electric driving
· A tool to make space in the city
· Sustainability
· Sustainability
· Create driving batteries from cars
· A big part of the members makes use of the vehicles as their second car.
· Pay less for a car you do not need
· Reduction of carbon emissions
· Less metal on the streets
· Doing it together
· Community integrated project

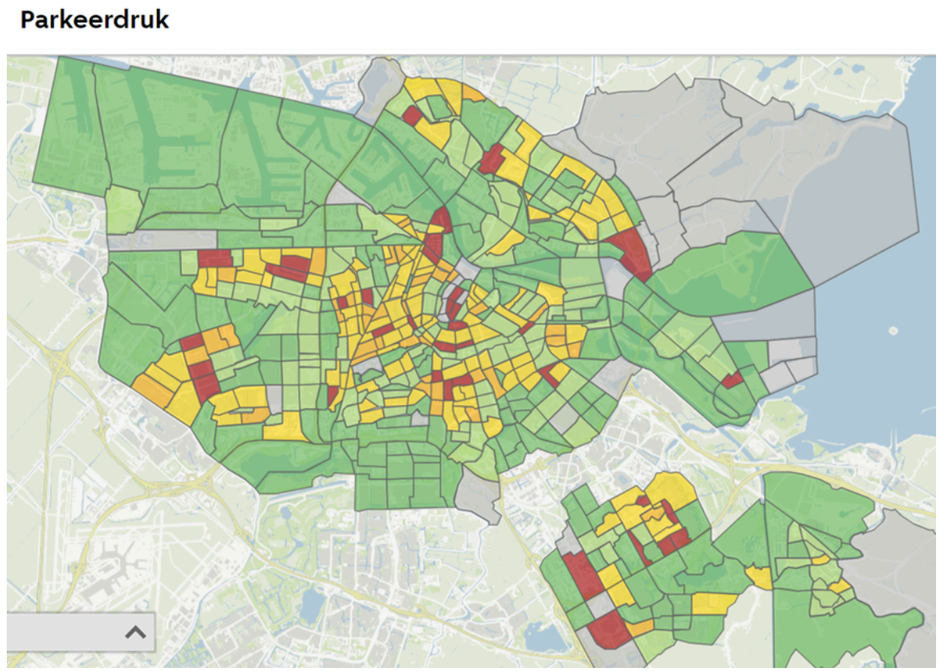
APPENDIX E – USER SEGMENTATION DATA



Shared mobility map (in Dutch)



Tram and metro map



Parking pressure map

The detailled overview with the data per criteria on district level

	Amsterdam	Nieuw-west	West	Centrum	Noord	Zuid-oost	Oost	Zuid
Mobility								
Parking pressure		Medium (few high)	**High**	**High**	Low (1 high)	Medium	Medium	Medium & Low (distribution)
Shared mobility		**Low**	Medium	High	Medium	Medium	**High & Low (distribution)**	High
Public transport (tram / metro)		**Low**	High	High	**Low**	**Low**	Medium	High
Public transport (train)		Station Sloterdijk, Lelylaan	-	Central Station	-	Bijlmer Arena, Duivendrecht, Diemen Zuid	Amstelstation, Muiderpoort, Sciencepark	Station Zuid, RAI
Public transport (ferry)		-	-	High	High		-	-
Parking nuisance	20%	**29%**	17%	19%	**21%**	**25%**	14%	15%
Car ownership (per citizen)	0.23	**0.27**	0.19	0.19	**0.29**	**0.25**	0.21	0.24
Car ownership (per household)	0.43	**0.55**	0.33	0.3	**0.59**	**0.46**	0.39	0.41
Citizens								
Total people	avg. 920.000	164.789	150.374	91.733	108.792	92.378	147.712	149.000
Average income		**42.300**	46.300	55.300	**42.100**	**35.800**	51.200	61.300
Age								
0-17 years old	16%	19%	13%	9%	20%	17%	16%	14%
18-26 years old	15%	16%	14%	18%	12%	17%	15%	15%
27-65 years old	57%	53%	63%	59%	54%	52%	58%	57%
66+ years old	13%	12%	10%	15%	14%	13%	11%	15%
Social Economic Score								
SES low	30%	**36%**	29%	24%	**35%**	**40%**	24%	23%
SES medium	27%	30%	24%	24%	30%	34%	23%	23%
SES high	44%	34%	47%	52%	34%	27%	52%	55%

APPENDIX F – SURVEY

Sectie 1 van 5

Car sharing with a group - Bellamybuurt

Thank you for filling out this survey.

Your answers are anonymous and will only be used for our research. The data will be kept for the duration of the study, and it will be deleted three months after the study is finished.

Do you live in the Bellamybuurt? *

- Yes, I live here
- No, I am here for work, for a visitor or else

Resident

Do you know car sharing with a group? *

In car sharing with a group, you share a car or other vehicle with, for example, your neighbors. You can start a group yourself or join an existing one. Together, you decide on the type of vehicle, how often you use it, and how to split the costs.

- Yes
- No

Would you be interested in car sharing with a group? *

- Yes
- No
- Maybe

What are your reasons for sharing a car with a group? Choose one or more options. *

- [ ] Save money
- [ ] Social reasons
- [ ] Shared responsibility
- [ ] Drive electric cars
- [ ] Easy
- [ ] Fixed parking spot
- [ ] Flexible use of cars
- [ ] Collaboration
- [ ] In charge of own mobility
- [ ] Drive different type of vehicles
- [ ] Better for the environment
- [ ] Less parking issues
- [ ] Anders: _____

What are your reasons for NOT sharing a car with a group? Choose one or more options. *

- [ ] Unsure about availability
- [ ] No time to organise
- [ ] Need the car too much
- [ ] Not with my neighbours
- [ ] I do not want to share
- [ ] Too expensive
- [ ] Do not need a car
- [ ] Complicated
- [ ] Dirty cars
- [ ] Discomfortable
- [ ] Unexpected events
- [ ] Anders: _____

Do you want to participate in a follow-up study about car sharing in a group? If you join, you will receive a €50 gift card! *

- ◯ Yes
- ◯ No
- ◯ Maybe (I want more information)

Do you have any comments or ideas about car sharing in a group?

Jouw antwoord

Vorige | Volgende | Formulier wissen

Great that you want to participate in the study!

Could you please give us your email address? Then we can contact you and send more information.

Jouw antwoord

Visitor

Do you live in Amsterdam? *

- ◯ Yes
- ◯ No

Do you know car sharing with a group? *

In car sharing with a group, you share a car or other vehicle with, for example, your neighbors. You can start a group yourself or join an existing one. Together, you decide on the type of vehicle, how often you use it, and how to split the costs.

- ◯ Yes
- ◯ No

What are your reasons for sharing a car with a group? Choose one or more options. *

- ☐ Save money
- ☐ Drive different type of vehicles
- ☐ Shared responsibility
- ☐ Flexible use of cars
- ☐ Drive electric cars
- ☐ Fixed parking spot
- ☐ Social reasons
- ☐ In charge of own mobility
- ☐ Less parking issues
- ☐ Better for the environment
- ☐ Collaboration
- ☐ Easy
- ☐ Anders: _____

What are your reasons for NOT sharing a car with a group? Choose one or more options. *

- ☐ Unexpected events
- ☐ Complicated
- ☐ Not with my neighbours
- ☐ Unsure about availability
- ☐ Dirty cars
- ☐ Need the car too much
- ☐ Too expensive
- ☐ I do not want to share
- ☐ No time to organise
- ☐ Do not need a car
- ☐ Discomfortable
- ☐ Anders: _____

APPENDIX G – TOOLKITS

YOUR WEEKDAY **PARTICIPANT NUMBER:**

Time	Activities	Mobility	Feeling

YOUR CAR SHARING GROUP

NUMBER:

MEMBERS

Who are in your group?
With how many?
What are different roles in the group?

What would be your own role?

REASON FOR SHARING

VEHICLES

What type of vehicles would you want to share?
How many??

FINANCES

How would you distribute and share the costs?

AFSPRAKEN

What are important agreements for you?
How would you want to communicate with the group?

APPENDIX H - COLLECTION DESIGN INSIGHTS

Chapter 2

Promote public and active mobility
The STOMP principle should be the base for mobility strategies, prioritizing walking, cycling, public transport, and shared mobility over private vehicle ownership.

MaaC should be an addition to commercial shared mobility and public transport
Amsterdam's mobility system should rely on a combination of commercial shared mobility, MaaC, and public transport to address mobility challenges. MaaC should be integrated alongside commercial shared mobility as an alternative form.

Improve the infrastructure and policy
Improve the system, infrastructure, and policy to stimulate the transition to shared mobility.

Focus on adressing the adoption barriers
To improve accessibility the adoption barriers should be tackled or lowered.

Define the role of the Municipality
To provide the optimal position to foster integration and broad user adoption. Municipalities can play a key role in addressing barriers.

Focus on a short and long-term plan
A short-term and long-term plan is needed to initiatie broader adoption and facilitate the slow transition as cultural shift necessitates.

MaaC should have benefits over commercial to be adopted
Cooperative sharing is only interesting for users if it has clear benefits over commercial sharing.

Establish formal recognition
The success of Commons relies on the formal recognition by public parties.

MaaC can distribute over neighbourhoods
Initiatives can either continue to grow or split into multiple initiatives. MaaC initiatives have the potential to distribute from neighbourhood to another, which can lead to successful initiatives guiding and supporting new initiatives.

Commons relies on key Figures
Key Figures are enthusiastic individuals that genuinely believe in Commons and stimulate others to join.

Parking important incentive in the context of Amsterdam
Due to all the difficulties and high prices of parking.

Chapter 3

Target life changing events and systemic disruptions
To disrupt habitual behaviour.

Generate incentives to stimulate adoption

Such as reducing parking spaces or offering subsidies for shared transport services.

Ensure MaaC's accessibility and convenience

To create physical opportunity.

Promote benefits of MaaC
To create motivation and to reduce resistance from those with strong attachments to private cars.

Generate incentives to stimulate adoption
Such as reducing parking spaces or offering subsidies for shared transport services.

Ensure MaaC's accessibility and convenience
To create physical opportunity.

Work on infrastructure and policy
To foster physical capability.

Find the key adopter groups
To focus on and to stimulate broader adoption.

Chapter 4

Collaborate with initiatives on a trial framework
Trial periods for new members joining an initiative should be offered to experience MaaC with long-term commitment.

Consider a financial support plan for starting initiatives
As start-up costs are an important barrier, subsidies considered in a financial support plan could contribute to adoption.

Focus on reducing car dependency
Public transport plays a role in the availability anxiety and reduces car dependency.

Organise MaaC information and trial events
Information and trial events should be organised for residents to meet initiatives and/or gain knowledge on MaaC.

Collaborate with key Figures
Key Figures play a key role in the adoption and integration of MaaC as they lead the foundation and organisation of initiatives.

Foster collaboration between initiatives for knowledge sharing
Between initiatives to offer expert guidance and knowledge to new initiatives so they do not have to reinvent the wheel.

Design for the two types of members
Recognise that there are two types of members: key Figures and users. This opens the opportunity for residents to adopt MaaC who do not want to take on an organisational role, the strategy should consider both types.

Focus on adressing barriers in capability and opportunity
To stimulate broader adoption

Define the role of the Municipality
The Municipality should take on the role as facilitator, supporter and collaborator

Facilitate potential in policies for the bottom-up organisation
The initiatives should remain community-driven and bottom-up organised by empowering residents to lead MaaC initiatives.

Chapter 7 - general

Design context-specific approaches
To support the context and resident's needs, motivations, and barriers.

Provide a clear framework that shows how MaaC works
To shows how it works, the benefits it holds and its purpose. It is a tool that offers residents to use of a car over ownership to promote more sustainable mobility.

Design tools to help with MaaC
To improve the ease of use, as this is an important key motivation for residents.

Chapter 7 - Bellamybuurt

Promote access to EVs through MaaC
This aligns with the sustainable ambitions of residents.

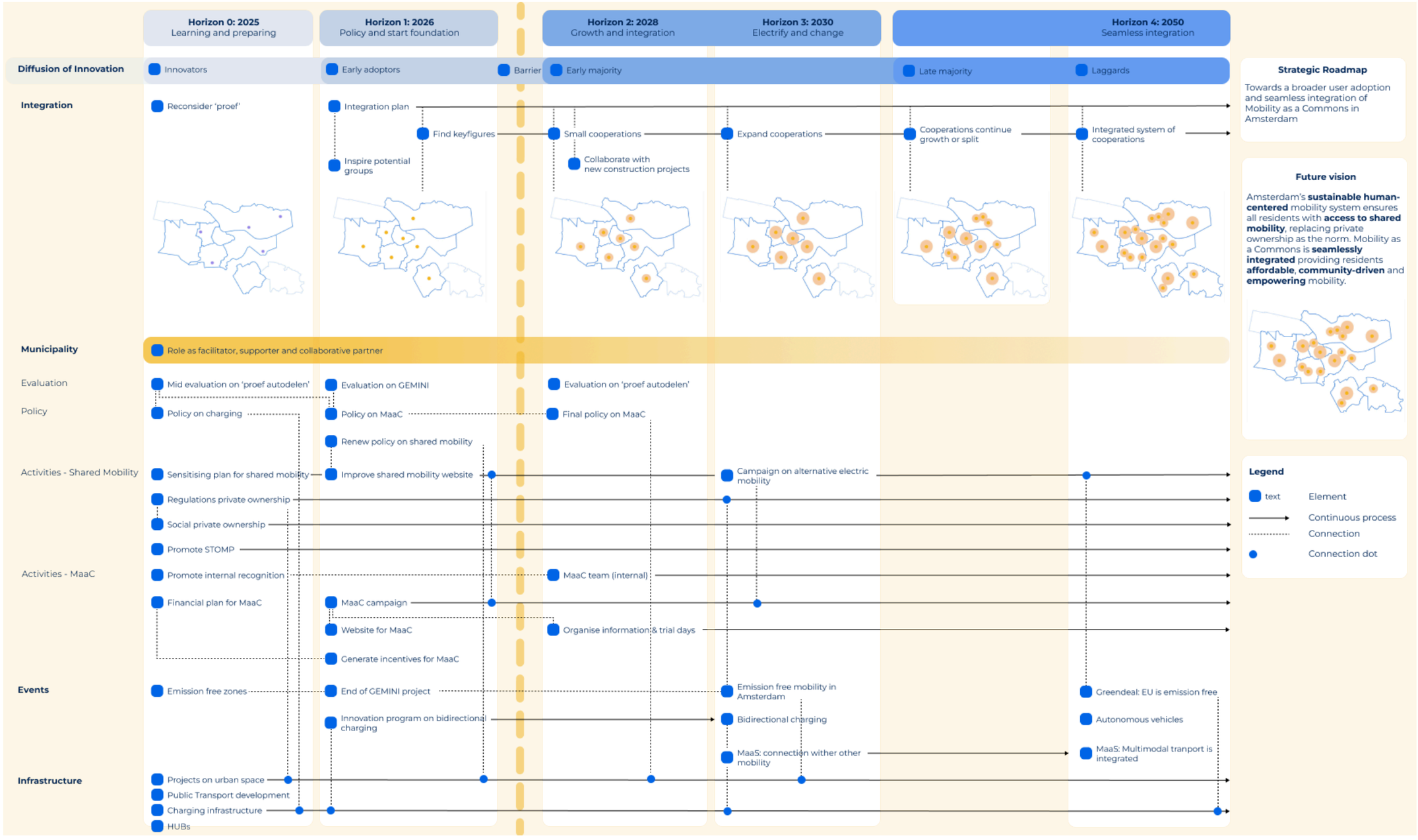
Look for close-knit groups as starting point
To stimulate the adoption of MaaC as they are already a community.

Promote financial benefits of MaaC
To address financial concerns and show finacial advantage over private ownership.

Collaborate with community workers
To educate them on shared mobility to build knowledge and support from within the community.

Organise local information events on shared mobility
To share information to improve understanding of shared mobility and to foster trust.

APPENDIX I – STRATEGIC ROADMAP ITERATION 1



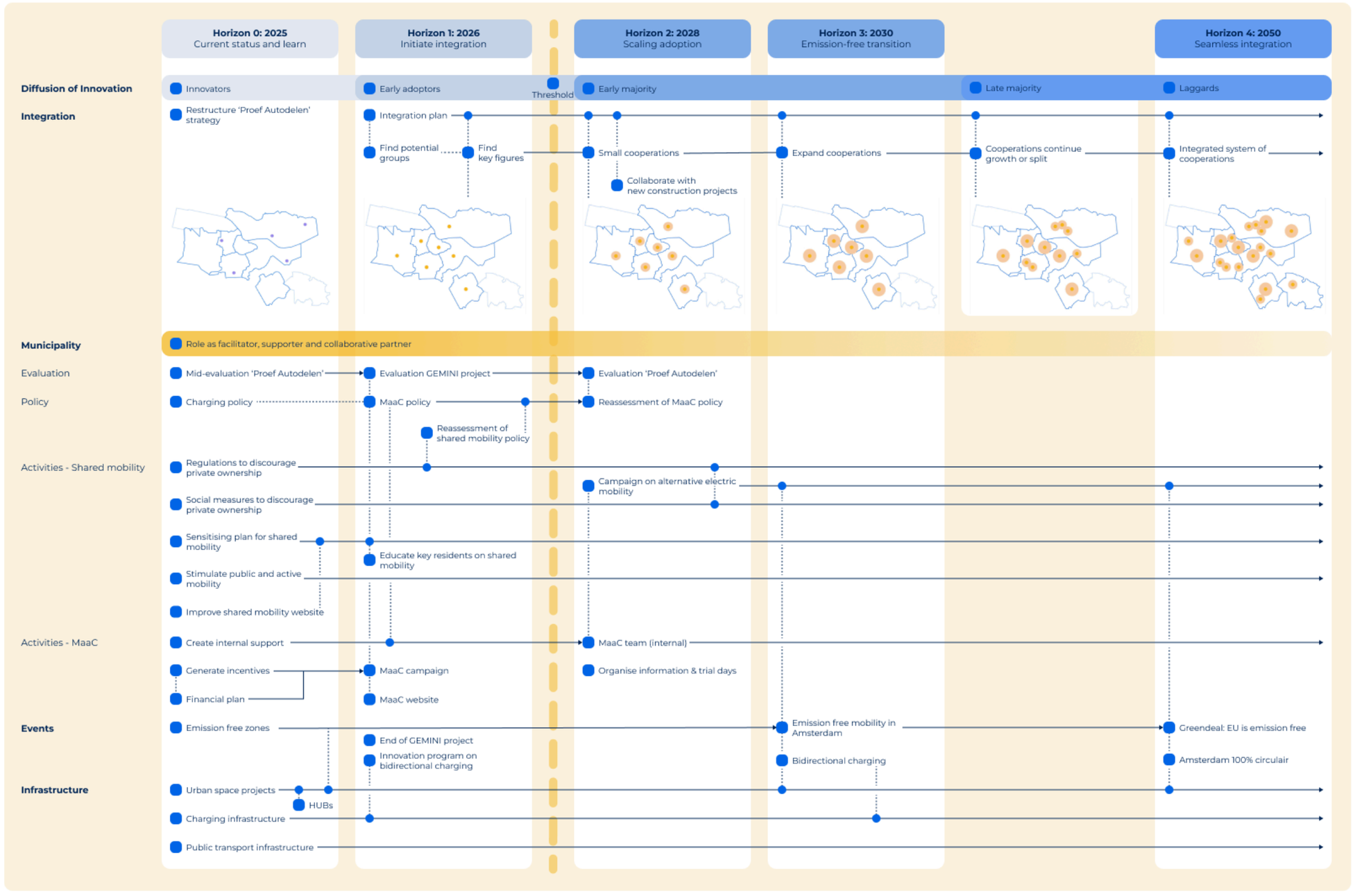
APPENDIX J – STRATEGIC ROADMAP ITERATION 2

Strategic Roadmap

Towards a broader user adoption and seamless integration of Mobility as a Commons in Amsterdam

Future vision

Amsterdam's **sustainable human-centered** mobility system ensures all residents with **access to shared mobility**, replacing private ownership as the norm. Mobility as a Commons is **seamlessly integrated** providing residents **affordable**, **community-driven** and **empowering** mobility.



Legend

- text — Element
- → — Continuous process
- ····· — Connection
- ● — Connection dot
- ▬ — Intensity

Babette van Lieverloo
Graduation Project
MSc Design for Interaction

Supervisors
Dr. Ir Suzanne Hiemstra-van Mastrigt
Ir. Gonny Hoekstra
Jop Pék

TU Delft
Gemeente Amsterdam



Faculty of Industrial Design Engineering
Langbergstraat 15
2628 CE Delft

ww.io.tudelft.nl