MASTER THESIS

Bottom-up intelligence: Exploring the role of agents for mobility orchestration in Negen Straatjes, Amsterdam

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Master's thesis

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Summary

This project explores the integration of artificial intelligence (AI) within the urban mobility framework of the Negen Straatjes neighborhood in Amsterdam, a dynamic area that has become increasingly popular among visitors, leading to significant mobility challenges. The research aims to design an intelligent layer that enhances the resilience and dynamic stability of urban mobility systems by prioritizing community engagement and bottom-up participation.

The thesis critically examines the current mobility strategies in Negen Straatjes, which have faced criticism for their lack of stakeholder involvement. It highlights instances of reactive measures, such as restrictions on crowds driven by social media trends, and last-minute changes to renovation plans that exemplify a top-down approach. The research underscores the necessity of incorporating input from affected stakeholders to achieve resilient and stable solutions.

To address these challenges, the thesis proposes a model where AI systems can facilitate continuous feedback loops between users and the system. By engaging citizens directly through conversational agents, the AI can learn and adapt over time, gaining a context-rich understanding of the neighborhood's dynamics. This interaction is designed to feel natural and intuitive, allowing users to contribute their insights and experiences, thereby fostering a sense of ownership and community involvement.

The proposed AI system is envisioned as a co-created solution that reflects the identity of the neighborhood while enhancing the visitor experience. It aims to support local businesses and residents by providing relevant information and suggestions at the right moment.

In summary, this thesis presents a comprehensive exploration of the role of AI in urban mobility, highlighting the importance of community engagement and the potential for innovative solutions that enhance both the quality of life for residents and the experience of visitors in the Negen Straatjes neighborhood.

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Introduction

In recent years, governments worldwide have increasingly embraced the concept of smart cities, integrating advanced sensing technologies and artificial intelligence (AI) into public spaces. This shift towards digital urban environments reflects a broader trend of cities becoming more adaptive and responsive to increase efficiency. Simultaneously, the concept of resilience has gained relevance, as cities must navigate the complexities of an unpredictable and rapidly changing world.

As smart cities evolve and become more dynamic, it is essential to critically assess whether the prevailing approach to implementing intelligence—often characterized by top-down structures—is the most effective strategy. Ideally, a city should strive to achieve a state of dynamic stability, where intelligent systems contribute to resilience by maintaining relevance for the community during ongoing changes.

This master thesis focuses on designing an intelligent layer for a mobility hub in the Negen Straatjes neighborhood in Amsterdam—a particularly dynamic area facing complex mobility challenges due to its explosive popularity among visitors, which causes numerous disturbances for the neighborhood's residents and entrepreneurs. The unique nature of this neighborhood presents an opportunity to explore how an intelligent layer can intervene to enhance its resilience, making it more dynamically stable.

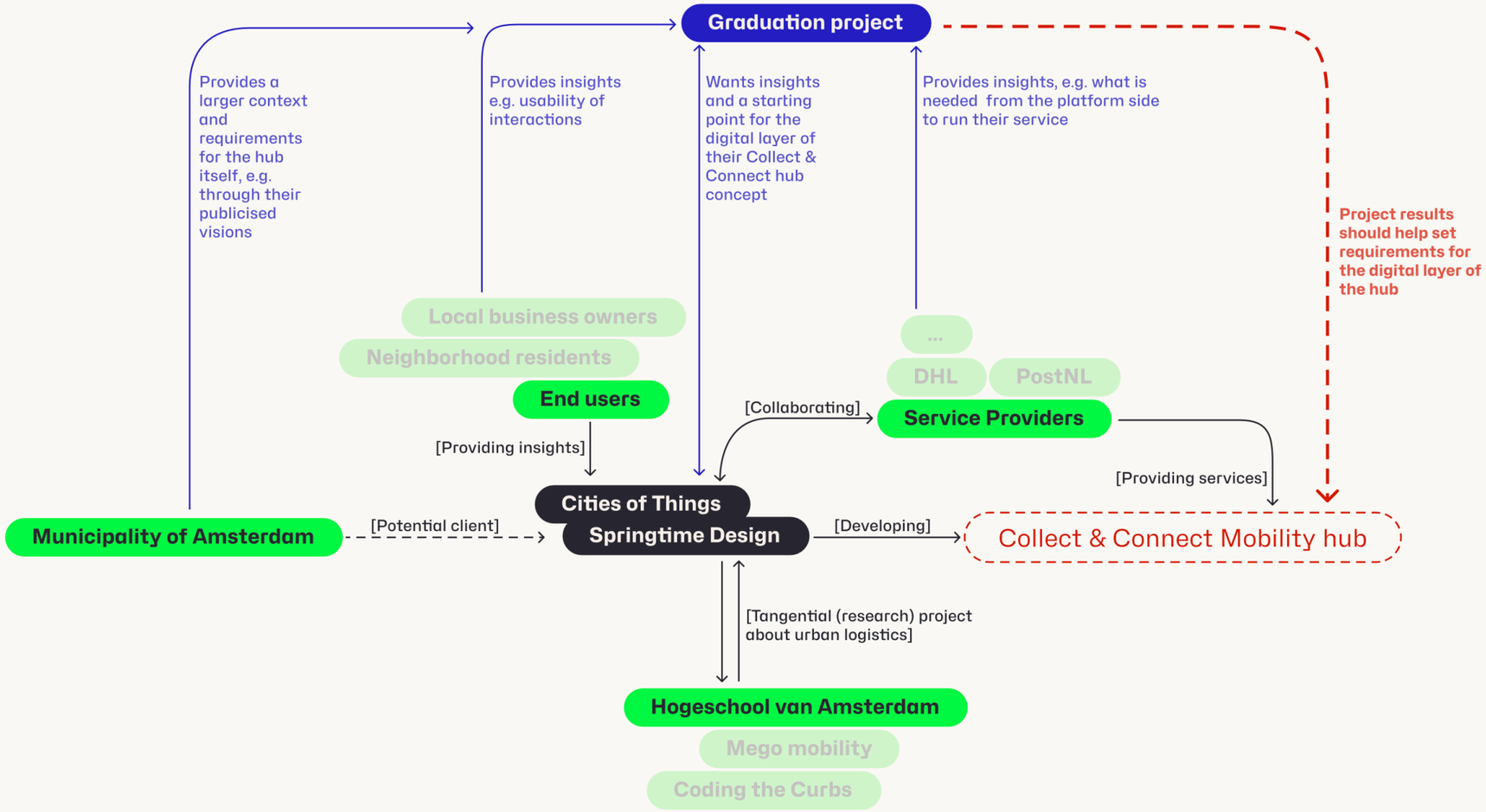
Through continuous research and the exploration of new perspectives, this project proposes a shift towards designing for bottom-up intelligence. This vision aims to address the imbalances caused by the dynamic disturbances in the city, ultimately contributing to a more resilient and dynamic urban environment.

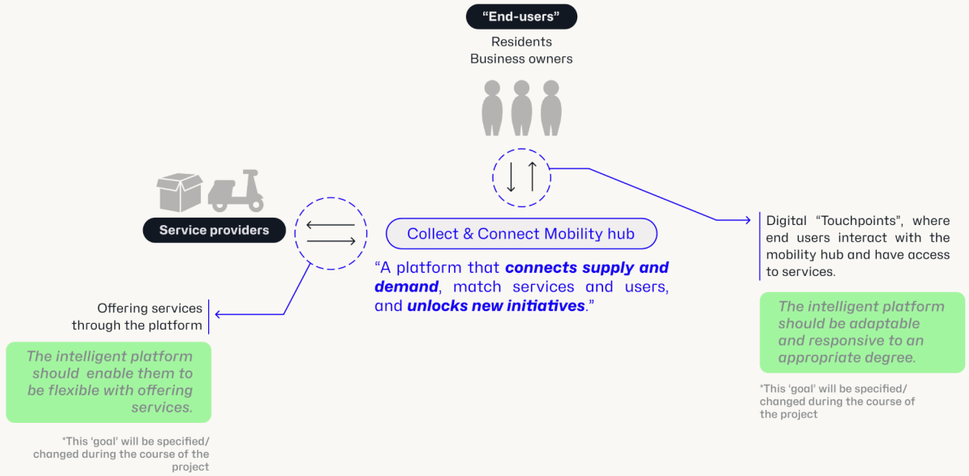
To further illustrate the vision, this thesis proposes the design of an AI system that supports both the neighborhood's identity and the visitor experience. The agent is co-designed by residents and entrepreneurs through a collaborative community platform on one hand, while being informed through touchpoints with visitors through a navigation service on the other hand, ensuring it reflects the neighborhood's evolving needs and values.

Project Background

This Graduation project was set up by Cities of Things Foundation and Springtime Design Studio to further develop their Collect & Connect mobility hub concept, which is meant to be implemented throughout Amsterdam. On the right, I've provided an overview of the stakeholders involved with the project, as well as the positioning of my graduation project.

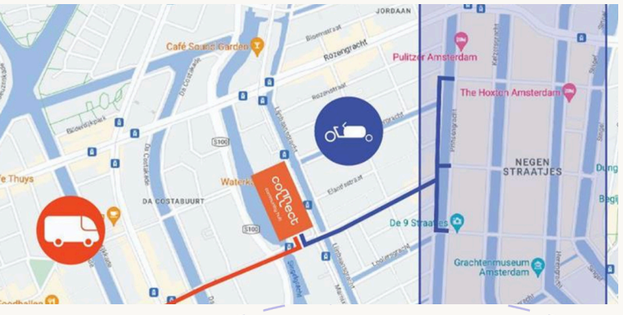
The hub serves as a centralized location where various shared mobility options, including e-scooters, (e-)bikes, and cargo bikes, are available for use. In addition to mobility resources, the hub would feature package lockers and facilities for sharing possessions, similar to Peerby. There would also be a café or lounge area for the community to connect. Flexibility should also be kept in mind, allowing for the potential addition of more facilities over time. A key focus of the concept is on building community and cohesion, though this aspect remains largely undefined.





There will be a digital platform linking users with service providers, granting access to various services. The exact nature of these services is still to be determined. Furthermore, the digital platform will incorporate an intelligent element, with AI playing a role, although the specifics of this role are also yet to be defined.

The initial location of the hub has been identified, as shown on the accompanying map. Please note that the orange square depicted does not accurately represent the actual size of the hub, which will be significantly smaller.



Project Approach

The aim of the process was for it to be exploratory, allowing flexibility and reducing restrictions on the research and whatever outcomes emerged, whether that's a product, service, or some kind of intervention.

Desk research was conducted initially, followed by a deeper dive into the context and various explorations. This led to a specific lens or vision for the project, which ultimately resulted in a broader intervention for the Negen Straatjes neighborhood.

The process was non-linear, which resulted in a lot of explorations done in different directions before a final direction was chosen.

1.Understanding the context

This chapter aims to set the stage by providing background information about some of the major themes and topics discussed during this project. The concept will be integrated into public urban infrastructure which will be implemented by the government, and will have an impact on citizen's daily lives. That's why recurring themes will include participation, urban planning, and democracy, aligning with the Cities of Things Foundation's perspective on the responsive and responsible implementation of technology within public urban spaces.

1.1 Method

Setting the stage refers to providing the necessary background information so the full scale of the project's context can be understood. To do this, I've done desk research, consulting (local) news articles, government and municipality plans, opinion pieces, and academic publications. The overall broad research question was as follows:

"What role could AI play for mobility in the Negen straatjes Neighborhood?"
(RQ1)

I split this into two main branches of research, in order to properly answer this question:

"How can a mobility hub provide value for Amsterdam?" (RQ2) and *"What are the implications of implementing Artificial Intelligence (AI) in a public context?"* (RQ3).

In the next sections, these are addressed, then reflected on through a conceptual output and conclusion.

1.2 Mobility in Amsterdam

Amsterdam has a problem. Currently, its inner city is crowded, noisy, and polluted. The solution they've rolled out is straightforward: implement 'zero emission zones' in the most densely populated areas to restrict access for large motor vehicles, reducing the disturbance they cause (Gemeente Amsterdam, 2023a). Streets will be less crowded, and the pollution and noise caused by engines cease to terrorize the neighborhood. Then, they've introduced window times (Venstertijden) outside busy hours where large vehicles are allowed to load and unload goods, usually between 7AMn to 12PM.

However, as you've probably anticipated, this solution alone would not capture the complexity of the situation. Businesses located in those zones still need logistics in large volumes throughout the day, and both businesses and residents need to make use of services that need to make their way in and out of the city. This is why Amsterdam has outlined a set of guidelines and plans to ensure the successful implementation of zero-emission zones. These include plans for allocating specific resources like parking spaces and green infrastructure, to the implementation of mobility hubs and broader sidewalks, and more. (Gemeente Amsterdam, 2023b)

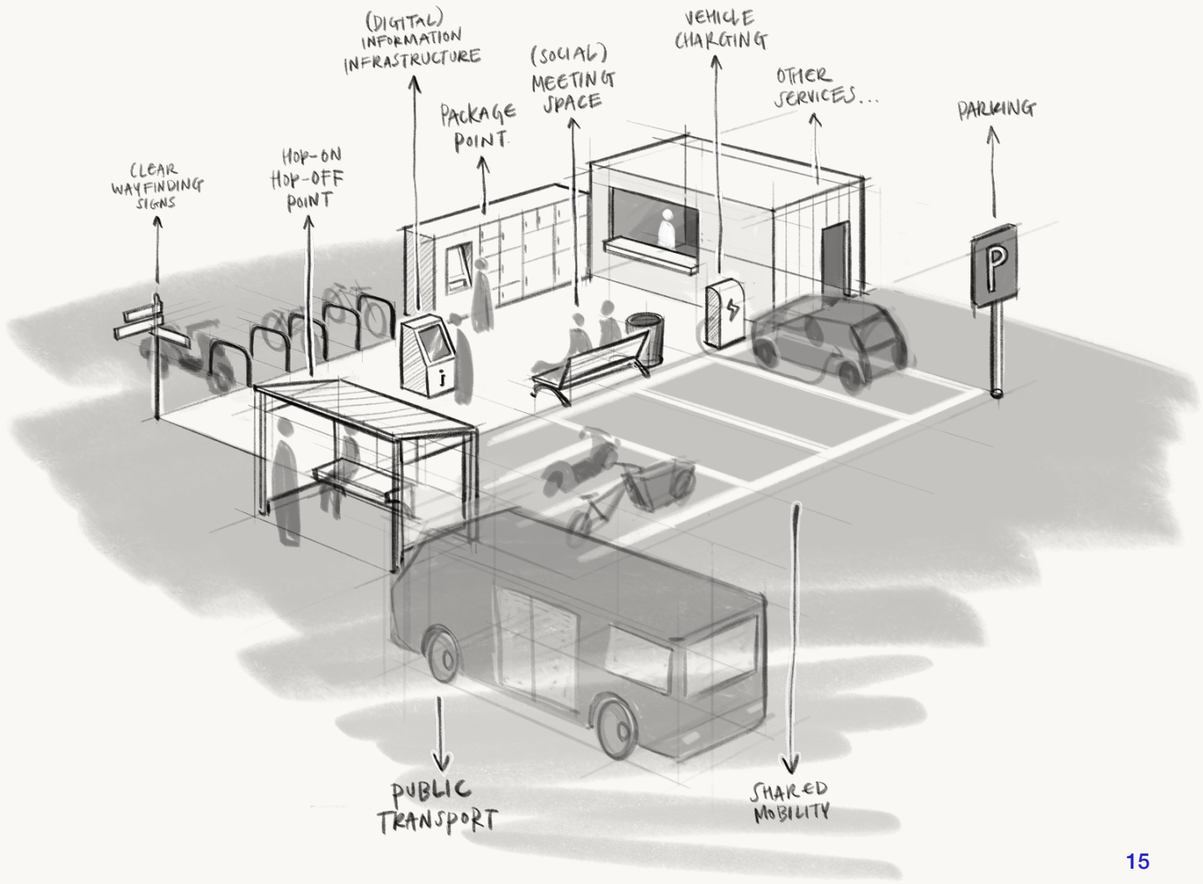
1.2.1 Mobility hubs defined

According to the Hub Vision ('Hubvisie') published by the municipality of Amsterdam in 2021, a mobility hub is a node in a multimodal mobility network, where different modes of transport and associated infrastructure come together. Elsewhere, the definitions are similar but emphasize different aspects based on each author's perspective.

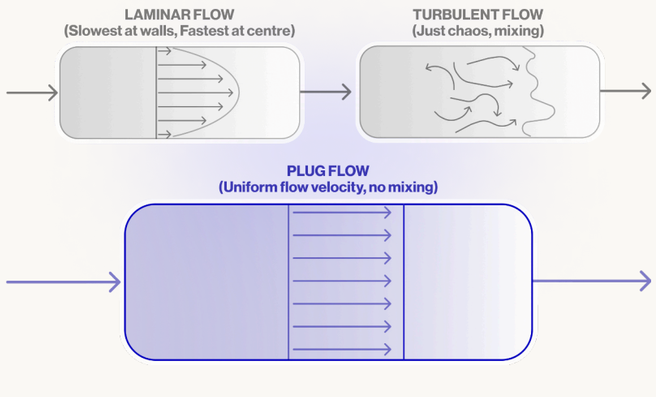
For example, Coenegrachts et al. (2021) mention that each hub's facilities, services and function vary based on each specific context and its stakeholders. CoMoUK (2019) adds that mobility hubs should be a recognizable place with information features to attract and benefit the traveler, for example through a digital sign that provides access to information or, for example, a journey planning service. They also state that hubs, in general, improve the public realm which requires a redesign of the space, which should improve the overall physical and social health of citizens. Both the aforementioned authors mention that mobility hubs offer either emerging or sustainable shared transportation options as alternatives to private motor vehicles such as cars.

Amoroso et al. state:

"...Intermodal hubs focus technical, social, urban, transport, service aspects and they play a multi-modal, multi-service, multioperator [sic] role." (2012)



Furthermore, they compare ‘intermodal’ hubs to plug flow, which is a concept in fluid dynamics where each element of fluid moves without mixing significantly with the adjacent elements. This results in a well-defined and predictable flow profile. The constant velocity, no mixing, and optimized flow are compared metaphorically with hubs, where multiple mobility options and convenient access work together to create an optimized movement of people and things (2012).



Okay, we have all these definitions. So what? Well, they highlight the practical dimension of multimodal mobility hubs as currently described, a seamless hop-on or off point for people between modalities to help people to go from A to B, and a physical location for the community to gain access to services. On the other hand, it touches the social and digital fabric of everyday urban life.

As previously stated, Collect & Connect mobility hub aims to be a space for the neighborhood community to come together, meaning the concept will intersect with the social dynamics of the neighborhood more. It takes it a step further, making it even more crucial to provide social value to the neighborhood.

For the mobility hub to provide value to the community, it needs to be well-integrated physically as well as digitally, meaning extensive knowledge of the context is needed for ‘successful’ implementation. Geurs et al. build on this further by highlighting the need for inclusivity in the design of mobility hubs, and how they should cater to the needs of a wide variety of users. They point to the rich literature on user and stakeholder participation in mobility planning, but at the same time, democratic (participation) integration is currently lacking in mobility hub concepts. (2022a)

In their publication for the European Institute of Innovation and Technology (EIT), Geurs et al. propose the **'Smart Hubs Integration ladder,'** as part of their Smart Hub program (2022b). Smart hubs do not refer to mobility hubs using smart technologies per se, but it is the name of their project that examines mobility hubs in European cities, and investigate whether “a co-designed, user-centric development can enable mobility hubs to act as a game changer towards inclusive sustainable urban mobility and accessibility”. They do this by applying research methods and co-designing tools in dedicated Living labs.

In the aforementioned publication, Geurs et al. break down three distinct integration areas to assess mobility hubs with: Physical, Digital, and Democratic. This helps with classification and to help inform improvement strategies for those hubs. The article defines a Smart Mobility Hub as a hub that offers advanced levels of physical, digital, and democratic integration. They argue that integration across all three typologies will create the most value for their users. Below, the three typologies are expanded upon.

At the highest level of integration, a physically well-integrated mobility hub acts like a seamless and ‘conflict free’ space, meaning no friction, as well as having ‘well designed’ features. This definition certainly brings to mind the plug flow analogy as described earlier. A digitally well integrated hub has simple and intuitive touchpoints which are accessible, and provides services that fit the local policies, incentives and societal goals.

1.2.2 A closer look at Amsterdam and Negen Straatjes neighborhood

As mentioned before, mobility hubs are part of Amsterdam's plan to establish a car-free city, as outlined in the municipality's series of implementation plans. In the **Hubvisie**, a dedicated publication on their plans and vision for mobility hubs, they lay out their analysis of the current situation, as well as the desired outcome for a car-free (‘autoluwe’, technically meaning ‘almost-no-cars’) city. (Amsterdam, 2021)

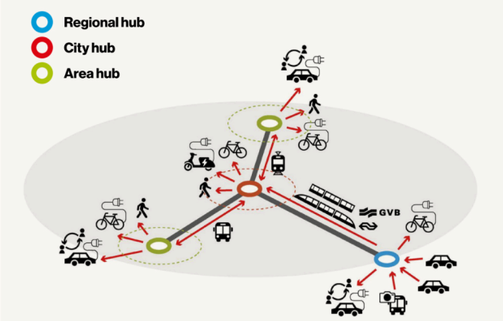


Figure: Visual overview of proposed hub system Hubvisie (Amsterdam, 2021) (Translated by me)

It’s important to understand Amsterdam’s vision because the Collect & Connect mobility hub concept arose -partially- as a response to that. In the end, when the concept has been developed further, it needs to fit their vision in a convincing way. At the start of my project, the team had been communicating with numerous representatives and stakeholders in and around the Negen Straatjes neighborhood in Amsterdam, and had discussed a space that could potentially be allocated to the hub.

Although the hub is intended to be implemented across Amsterdam, this neighborhood is likely to be the first place. The plan is to dive into the unique aspects of the Negen Straatjes neighborhood, trying to understand the dynamics and its unique challenges. This way, the research isn't just a checkbox for this neighborhood but becomes a solid foundation with insights that could benefit mobility hubs across the city of Amsterdam.

The term ‘Negen Straatjes’ was actually coined as part of a marketing strategy by a group of entrepreneurs in the 90s, to bring more attention and visitors to their area. Negen straatjes, meaning ‘Nine Streets’, in Dutch, refer to the 9 side streets of Prinsengracht, Keizersgracht, Herengracht and Singel, shown in the map below. Those streets at the time consisted of ‘quirky’ shops and boutiques, and they quickly gained popularity after the rebranding.

Figure: Runstraat 32, on the corner of Prinsengracht, almost 100 years apart (top: 1918, bottom: 2016)

Currently, most of the neighborhood is occupied by stores, such as boutiques and flagship stores, as well as eateries, hotels, galleries, and museums. All of these attract a large volume of visitors and tourists, which is also encouraged by travel guides published by the municipality, as well as travel media publishers like Lonely Planet, calling it the best neighborhood for shopping (2023).

All this attention and bustle brings a lot of movement in and around the neighborhood, both of people and things. In 2015, residents already declared that the streets were ‘overly saturated’, specifically referring to the tourist crowds and Airbnb in the area (Kruyswijk, 2015). These crowds have only increased since then (Gemeente Amsterdam, 2023), causing more annoyance to inhabitants, and resulting in multiple calls aimed at the municipality to intervene in some way. A clear example is an initiative set up by multiple neighborhood interest groups in Amsterdam, including the 9S neighborhood, called ‘T is genoeg XXX!’ (Translation: That’s enough XXX!; XXX referring to the flag of Amsterdam)

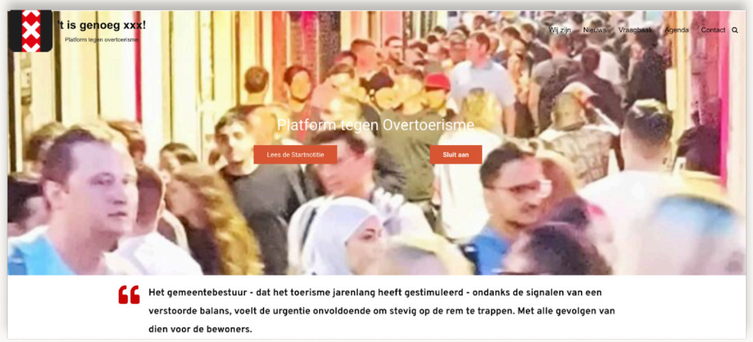


Image: Screenshot of website: ‘T is genoeg xxx!

Title on image: Platform against over-tourism, Quote text below: The municipal government - which has promoted tourism for years - despite the signs of an imbalance, does not feel the urgency to firmly apply the brakes. With dire consequences for residents. (Translated by me), 2023

Previously conducted interviews for Project Raak (HvA) provided by Springtime Design highlight a lot of reflections by business owners, some residents, and delivery drivers. They acknowledge the increasing congestion on the streets caused by their logistic flows, but they also state that it is almost impossible for them to do anything about it.

In the city, various stakeholders, including entrepreneurs and residents, presently rely on separate logistics streams. Each package follows an independent path, lacking collaboration. According to Professor of urban logistics at the University of Applied Sciences in Amsterdam (HvA), Walther Ploos van Amstel, combining these streams could enhance efficiency and alleviate street congestion. In an opinion piece published on gebiedsontwikkeling.nu, he reflects that collaboration between stakeholders, by bundling transport, sharing logistics infrastructure and space capacity is the most pressing next step.

In general, entrepreneurs and residents in 9S are in favor of regulations to reduce traffic. Less traffic is seen as more desirable for the community, and contributes to the area's atmosphere. At the same time, 9S has a 'hectic' character that is typical for the neighborhood, and actually something they like about it.

"Car and bike-free is[sic] found attractive by the ceramics store. The rest (of the interviewees) fear an overly museum-like neighborhood. And loss of the locality, the charm of the mixed and somewhat hectic character." (Raak, 2023)

Although the area has a history of serving a mixed crowd of visitors, a decrease in social cohesion is felt, which prompted residents to initiate their own advocacy group, called Grachten9+ (Dutch for Canals9+). Scanning through their web page provides insights into what's currently happening in the neighborhood and the key concerns that matter to them, which include overcrowding and other nuisances caused by visitors.

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In Amsterdam, things are changing rapidly due to new government regulations towards car-free zones in the city. Entrepreneurs need to respond, adapt, experiment, and make mistakes to discover what works for them. At the same time, there is minimal collaboration or communication among them, despite experts determining that this could significantly streamline the logistical flow.

1.3 Smart Mobility in Amsterdam

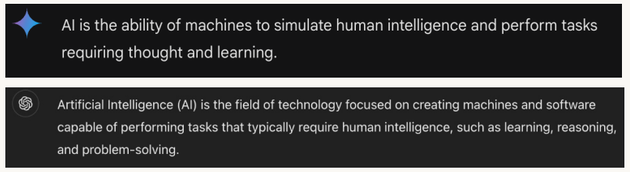
This section will be used to zoom out a little bit. We've discussed the project, particularly the physical context in Amsterdam. Now, I would like to properly set the stage for the proposed intelligent layer. Introducing smartness to the Collect & Connect hub did not manifest in a vacuum. Cities of Things Foundation focuses on the increasing presence of 'intelligent things' in the urban context, and how new relationships and interactions can be designed.

In Human-Computer Interaction (HCI), human-AI interactions are carefully considered to facilitate the right balance in responsibility. At the same time, we cannot overlook introducing smartness in the urban context and how this affects the city and its citizens. In this chapter, I will lay out how I've framed intelligence in the city, which will be used to frame the rest of the project.

1.3.1 Defining Intelligence, smartness, and AI.

First, it is important to establish what we are talking about when it comes to intelligence and AI. AI is often referred to as an 'Intelligence', or 'smartness' based on its common interpretation that it mimics human intelligence. In this thesis, these terms are used interchangeably.

When prompted with the question: **'What is AI?'** Many might immediately think of ChatGPT, which is a program that has surged in popularity and is becoming increasingly present in the public consciousness due to its growing impact. ChatGPT is indeed a program that uses AI, a language learning model to generate 'human like' text. When we ask both ChatGPT (OpenAI, 2024) and Gemini (Google, 2024) to define AI in one sentence, they define it as the ability of machines to simulate human intelligence processes, for example: learning, problem-solving, and decision-making.



According to Duberry (2022), it is challenging to get a common definition for AI as it is an emerging technology whose applications are so vast and diverse that it is hard to create a common definition. He mentions AI being described in relation to human intelligence by a vast number of works, but concludes that this definition proposes 'an ideal target rather than a concrete and measurable research concept'.

Many works spend time trying to create an abstract definition of human intelligence that can then be translated onto concrete workings of AI, which is entirely dependent on its application. This is why I've taken the definition from Duberry's book, Artificial Intelligence and Democracy, which goes in depth into the use of AI in the public context. He adapts a definition for AI proposed by Graglia et al. (2018), which is *"The capacity to observe it's [sic] environment, learn from it, and take smart action or propose decisions."*.

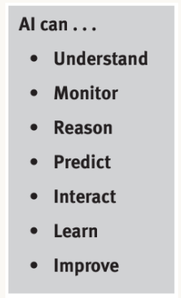


Figure: A simple diagram found in Artificial Intelligence for citizen services and government shows a similar, more structured understanding of AI. (Mehr, 2017)

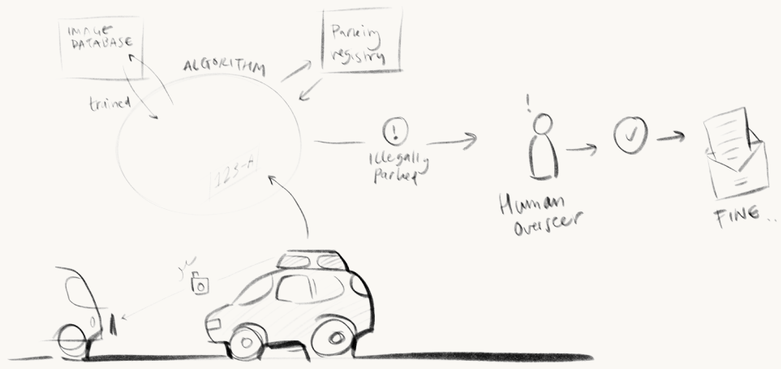
These are still abstract definitions, that's why it's better to put AI in context to understand what it is. To do this, I've collected two examples published by the municipality of Amsterdam, as well as the **Algoritmeregister,** an online database they set up, which provides an overview of all algorithms used to provide municipal services. Both examples are used within the context of mobility and public space in Amsterdam and offer insights into relevant discussions surrounding the application of AI in this domain.

Figure: A Parking scanning car (Gemeente Amsterdam, 2023)

The first example is already implemented and impactful for citizens: **a 'scanning' car** which checks for illegally parked cars. While driving around in neighborhoods, a camera captures number plates on parked cars, which are recognized by an image recognition algorithm. The national parking registry is referenced to check if the car has a right to park there, and the number plate is marked by the algorithm after which a human overseer will check for special circumstances by looking at the footage, or, if things are unclear, someone will be sent to the location to get a better sense of the situation. If there are no special circumstances that somehow exempt the car owner, and the car is deemed parked illegally, they get a fine through the mail.

The role of AI here is simple: being trained to recognize number plates as accurately as possible across various conditions (Lighting, weather, picture angles, etc), it records them quickly, so it can be checked with the database. This system replaces a human parking enforcement officer, performing the same task on a larger and faster scale.

Amsterdam is effectively using AI to aid in law enforcement, which is extremely impactful and sensitive. It raises some concerns regarding **transparency** and **explainability**, since citizens should be able to contest the fine in court if they don't agree. The decision making process of the algorithm is effectively a black box in many cases, and you can't exactly invite the algorithm to court to ask questions. Alfrink, who coined the term contestable AI (2023), describes the need for accountability in such automated decision making processes, advocating for systems that are contestable by design.



The second example is called **Public Eye** , created by Tapp (2021), a design agency that develops working solutions and concepts for smart cities. Public eye is an algorithm that can tap(p) into any public camera, and count the size, density, direction, and speed of crowds in a public space. At the same time, the output, which is a data-visualization dashboard to show real time ‘busyness’, is anonymized, providing privacy to any person captured on camera.

Here, AI is used to unlock valuable insights for cities which were previously difficult or impossible to obtain. A model has been trained to recognize an individual person, count them, and track its direction and speed. This creates numerous new use cases for the city, for example predicting queueing times at PCR test facilities, or managing crowds and using the data for earlier intervention.

An important theme in this project is privacy, which Tapp has carefully considered in their design process. Since the AI system would tap into a public camera, steps have to be taken to make sure no single individual and their behavior can be traced back from the output. The upcoming AI act (European Union, in progress) places a significant emphasis on privacy, as it recognizes the potential risks that AI systems may pose to citizen’s personal data. Anonymizing the individuals tracked by public camera’s is essential, as unaltered images of individuals contain biometric data (facial features, potential behavioral characteristics) which could be used for surveillance or profiling, which would infringe on the subject’s right to privacy.

1.3.2 Social Agents and potential roles for AI in the public context

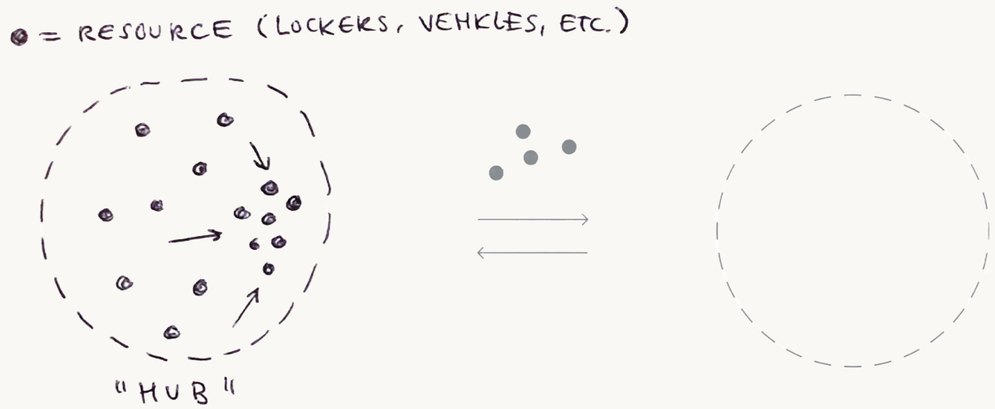
So this is where we get closer to the domain of AI that this project might specifically address. There is a difference between designing with the practical solutions AI has to offer, like we’ve seen on the algorithm register, and designing for interactions between humans and AI agents. Although at this stage, I haven’t exactly defined what role AI will play, the clients envision an AI agent that actively contributes to the neighborhood’s social dynamic. As outlined in the design brief, we're tasked with defining AI's role in this context, which I’ve decided to set to the public.

The most promising opportunity for AI is to lower the barrier for **citizen engagement** with the democratic process, which has been proven by experiments with using social agents/ chatbots (Duberry, 2022) This is the case because currently, the way to get feedback or any type of engagement by the public is not always effective, as many citizens are unaware of the opportunities, or if they do, the process is too intimidating for them. By creating engaging, and understandable ways to interact through chatbots, citizen engagement can be improved purely by lowering the barrier this way.

Other opportunities for AI applications, as described by Mehr (2017), largely have to do with being able to deal with an increasing amount of data being collected and processed, and dealing with more complex tasks that evolve out of that. AI can do pattern recognition and derive conclusions from them at a much higher pace than humans can, like we’ve seen with the parking control algorithm.

Resource allocation is another opportunity Mehr mentions, which might become relevant in our context.

The hub is supposed to provide some kind of platform where service providers or other initiators can set up services using the resources it has to offer. If we could use AI to understand which resources are available, what the neighborhood might need, and knowing what the service providers are aiming for, it could provide a supporting role in coming up with fitting solutions for the neighborhood.



1.3.3 Community owned agents

Some other opportunities with AI that have come out of my more general research exploration is two areas: supporting Experimentation and supporting collaboration and organizing between stakeholders.

AI can support experimentation by automating certain processes, and it can help stakeholders interpret data, thus making better conclusions based on experiments. However, it should be noted that this has not been tested in the public services context.

Jain et al. (2022) concludes that AI-enabled tools in social development organizations positively impact collaboration, with factors like effort expectancy, performance expectancy, social influence, and facilitating conditions positively associated with their use. However, Beo et al. (2021) presses that addressing AI aversion is crucial for successful adoption and integration.

With this in mind, one idea is to explore something called a **community owned agent**. This is a bit of a sidetrack, but I came across an interesting short paper by Luria et al. (2020), who experimented with chatbots in online communities to investigate if the community would gain a sense of collective ownership over a chatbot agent. Within a few weeks, Babybot, the agent they designed, slowly learned from the community's behavior, interacted with them, and eventually successfully integrated with the community while engaging its members. Meaning, they were able to use an AI agent to create more engagement within the community. Luria argues that creating a sense of ownership has largely contributed to that. But in order to design for more than a false sense of ownership, agents need to be co-created with the community. This angle is interesting because most of the research and use cases for conversational AI have been about single human-AI interactions, while maybe, in the context of this project, multiple stakeholders would be involved, possibly interacting with the agent at the same time. We call the former, one human - AI interactions dyadic, while multiple humans interacting with AI are **polyadic interactions**.

This seems relevant to me as the intelligent layer in Negen Straatjes will be implemented in the context of a community, and it would be interesting to design with community owned agents. Can this sense of ownership somehow contribute to enhanced participation? What kind of human-agent interactions might contribute to an increased sense of ownership among neighborhood community members?

1.4 Towards a research gap: Dynamic stability through continuous participation

The application of AI in the urban context and public spaces in general is becoming a prominent theme in literature, which reflects growing concern about the rapid adoption of the new technology by governments and corporations. Cities using AI and the Internet of Things (IoT) to enhance urban infrastructure, streamline public services, and gather real-time data for decision-making, can be dubbed as smart cities. Just like with AI, there is no agreed upon definition for smart cities, with many authors defining the ideal outcome or manifestations instead: from sustainable solutions, innovation facilitation (Duarte, 2015), to enhancing competition and quality of life (Borda, 2019).

Critics of smart cities (policies) say Democracy and human centeredness is under threat. Smart urban implementations neglect prioritizing the citizen experience in favor of optimizing and streamlining urban processes and systems for efficiency. (Adreani et al., 2019).

We also see increasing discussions about resilience in the urban context, which is triggered by Uncertain, turbulent times (Covid, Effects of climate change, recession, political instability). POLIS (2021) declares that identifying and fulfilling emerging and temporary needs are part of key strategies for resilience, also specifically for urban mobility. They also include experimentation and integrating stakeholder and citizen participation throughout planning process and evaluation.

A gap in the literature reveals missing cases of participation after the implementation of new infrastructure, with a particular absence of a feedback loop. We also see this in the tools EIT is providing: their co-creation tools are an excellent way to develop means to involve stakeholders in the decision making process. However, the output of their involvement through these co-creation sessions remains a snapshot assessment of their needs in this specific moment.

If we look at smart cities, one could say that infrastructure is not as static as before, as with the ability to collect and analyze real time data, systems can become more adaptive. With infrastructure becoming more dynamic, it would seem that this aforementioned feedback loop would become even more relevant.

We just mentioned the increasing interest in designing for a resilient city, one which is becoming increasingly dynamic, not only due to turbulent times, but also due to the transition to smart cities.

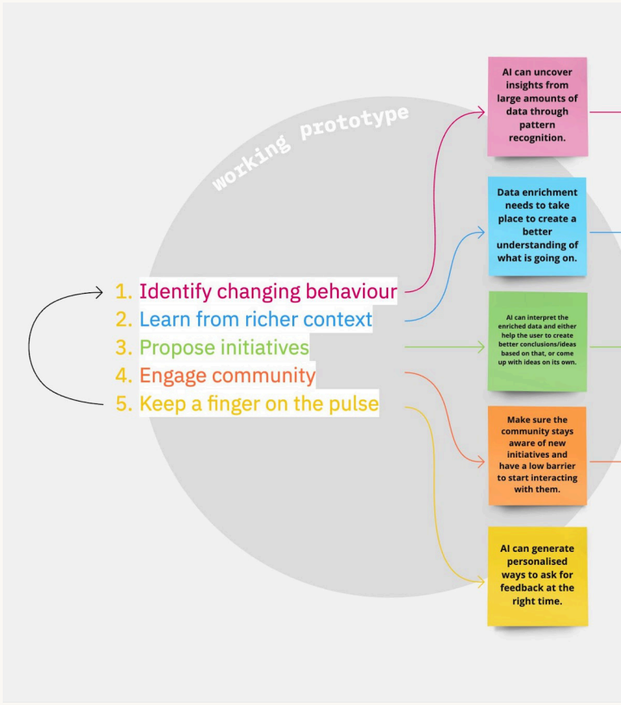
Kim et al. defines dynamic stability as the ability of a system to arrive at a steady (previous or new) state after a significant disturbance, which describes the ideal condition, or objective, for an organization to strive for.

Mobility related strategies for resilience should address how to manage the turbulent nature of disturbances. Returning to the mobility hub concept, it is fundamentally a dynamic hub in many respects, featuring an agent that learns and allows the hub to adapt to the changing needs of the neighborhood. By being dynamic, the hub remains relevant to the community, enhancing its value and resilience. Not only could the agent engage the community prior to implementation, but it could also maintain their involvement afterward. In essence, AI plays a crucial role in facilitating the feedback loop.

1.5 Sensemaking through a quick exploration of an AI-facilitated feedback loop

To make sense of the exploration in literature I did, I came up with a system in which an AI agent facilitates an entire loop of implementing a service or initiative, and making sure it stays relevant for the community by keeping a finger on the pulse. The idea behind this exercise is to communicate some of the main conclusions through some kind of **conceptual output**, which also helps me to structure my thoughts around this initial stage of understanding the context. It also shows **relevant affordances** an intelligent system might provide.

Let's say there is 5 different AI agents involved with the hub, all committed to help create and encourage services being initiated for the community. Their aim is to pick up on changes happening in the neighborhood and learn more about it, propose initiatives to the right stakeholders, engaging the community to be aware of the initiatives, and lastly, collecting feedback to learn from.

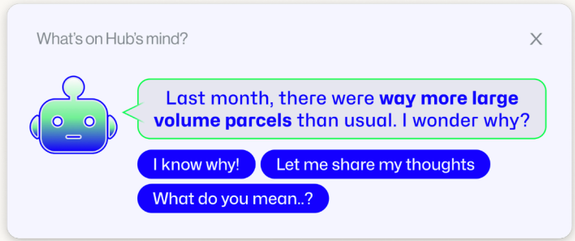


1. Identify changing behavior

First off, as we have already discussed, AI can go through large amounts of data and draw conclusions based on those, better and faster than a human can. Let's say we keep track of mobility patterns in the city, or what people use the space for. The agent could learn and figure out which one of those changes would be interesting for service providers, also partly based on predetermined values or conditions, similar to how the scanning car algorithm can flag a number plate by cross referencing the parking database. In this context, AI does not necessarily require human interaction. However, the useful data it has access to might be limited, to comply with privacy regulations, which are currently not yet black and white.

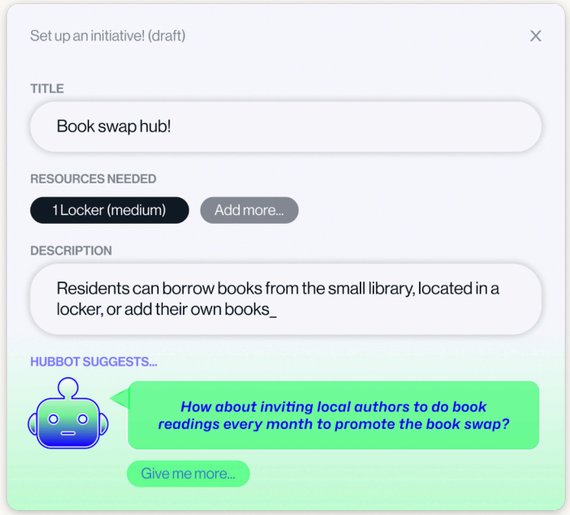
2. Learn from richer context

This step could also be called ‘Data enrichment’. Basically, the agent could encourage stakeholders to add on to the information it already has, so it's able to make better suggestions for service providers. In the scanning car example, this part is done by the human overseer, investigating the scene further to gain understanding of the situation. Here, an agent would prompt stakeholders to help, which might be challenging unless there is an incentive for them to contribute somehow.



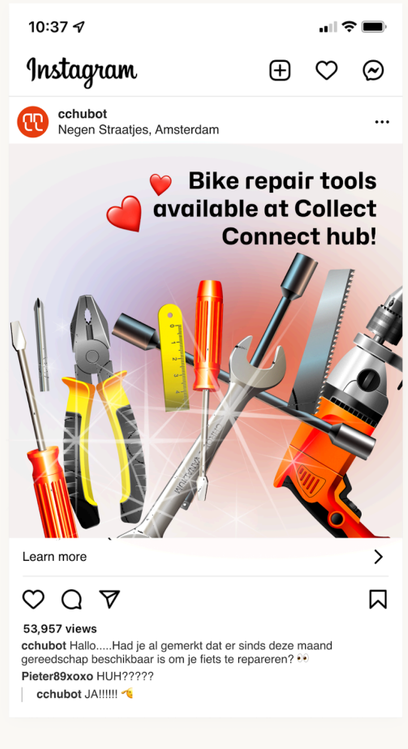
3. Propose initiatives

Using the enriched data, the agent could give suggestions in real time while someone is setting up a new service through the hub’s online platform. Here, anyone can set up an initiative through the portal. Let's say you want to have a small library, or book swap, through one of the hub’s parcel lockers. The agent happens to know the neighborhood has had an increasing interest in cultural events lately, so they could add a fitting suggestion. On the platform itself, there could also be daily ideas to inspire potential initiators. Ideally, the agent would keep learning to make better suggestions. This could be done in many ways, analyzing the final service descriptions, and tracking how the users interact with the suggestions.



4. Engage the community

What if there was an agent running the hub’s social media account, making posts and commenting about the services and activities going on? They could engage with the community through the comments, or even respond to questions through direct messaging. Using a platform like instagram would bring a lower barrier for engagement, and the engagement data could also be used to in turn gauge how the community is responding to services. Also, having a bot instead of a person to engage with, would be a different dynamic as opposed to a human social media manager. Using the comment section could be an opportunity for some interesting polyadic interactions. Research suggests that people may experience a lower barrier to, for example, complaining to chatbots compared to humans, but depending on the context there are too many factors that could influence this dynamic, which would also make it an interesting case for prototyping.



5. Keep a finger on the pulse

There is several ways to make sure the hub is still relevant to the community, one of them is explained above.

This exercise brought up some interesting potential design research directions for me. For example, currently, I am making assumptions on what might change over time for the neighborhood. Maybe its types of packages, interests in cultural activity, or less movement by residents at night, because they feel unsafe with the crowds? But what does dynamicity actually look like, and how could AI play a role in that?

1.6 Conclusion

There is much to say about the role AI can play to contribute to resilient cities. Social agents can be used to engage stakeholders which usually experience a larger barrier to participate in the democratic process. There are additional, potentially more fruitful opportunities if we consider community owned agents.

Furthermore, cities will benefit from a continuous feedback loop to keep a finger on the pulse with regards to the efficacy of implemented measures, or, in our case, services through the collect & connect mobility hub.

2.Diving deeper

This chapter dives into pointed research into the context, discovering what dynamicity means for the 9S neighborhood and what the value for an intelligent layer might bring for dynamically stable mobility in Amsterdam. The results of this part of the research will be a stakeholder map and conclusions on dynamicity, which I can use to properly reflect on the AI facilitated feedback loop and propose the next step.

2.1 Method

The research first started off with observations I did in the Negen Straatjes (9S) neighborhood. My intentions were to capture and reflect on any scenes I witnessed regarding mobility, and to get grounded for any further research on the area.

To get a quick understanding of 9S from an ‘insider’ perspective, I needed to speak to someone with a deep understanding of the neighborhood. I was able to connect with S., A spokesperson and representative of the area, particularly for entrepreneurs. S. primarily advocates for the interests of local business owners, maintains contact with them and with local residents, and frequently represents the neighborhood in discussions with the municipality and in the media.

Before our meeting, I set up a pilot session with the project company mentors, and gained some useful feedback which I used to adapt the session plan (Appendix).

The purpose of the meeting with S. was to get an understanding of the **stakeholders** involved, what needs they have in terms of mobility, and

Image: Meeting S. At a busy cafe in the neighborhood, with some prepared material and empty sheets of paper for notes and drawings.

how this changes over time. At the same time, I am trying to get a sense of how the neighborhood has changed over time in general.

These insights were mostly synthesized into a large **stakeholder map** (appendix), which at first included all the parties S. mentioned. Then, other insights into the area were used as a starting point for more pointed research into relevant topics, mostly through scanning local newspapers and interest groups websites.

Reflections on that research were used to create a final stakeholder map and final conclusion into dynamicity and the appropriate role for AI in the Negen Straatjes neighborhood.

2.2 Describing mobility in

While walking through the 9S, I observed many interesting things happening on the street related to **mobility and flow on the street**. I was lucky to capture one particular occurrence, two photos taken within less than a minute of each other.

In photo 1 (top), I noticed a white delivery vehicle pulled over on the street. A Coolblue (blue) van started driving up to it and the driver looked visibly annoyed, trying to see what was going on, presumably not sure why the vehicle was standing still. The driver of the white van was actually absent, he was inside the white cafe. In a matter of seconds, as you can see in the bottom image, another van pulled up behind the blue one, and the congestion caused cyclists to bike on the sidewalk, causing numerous unsafe situations.

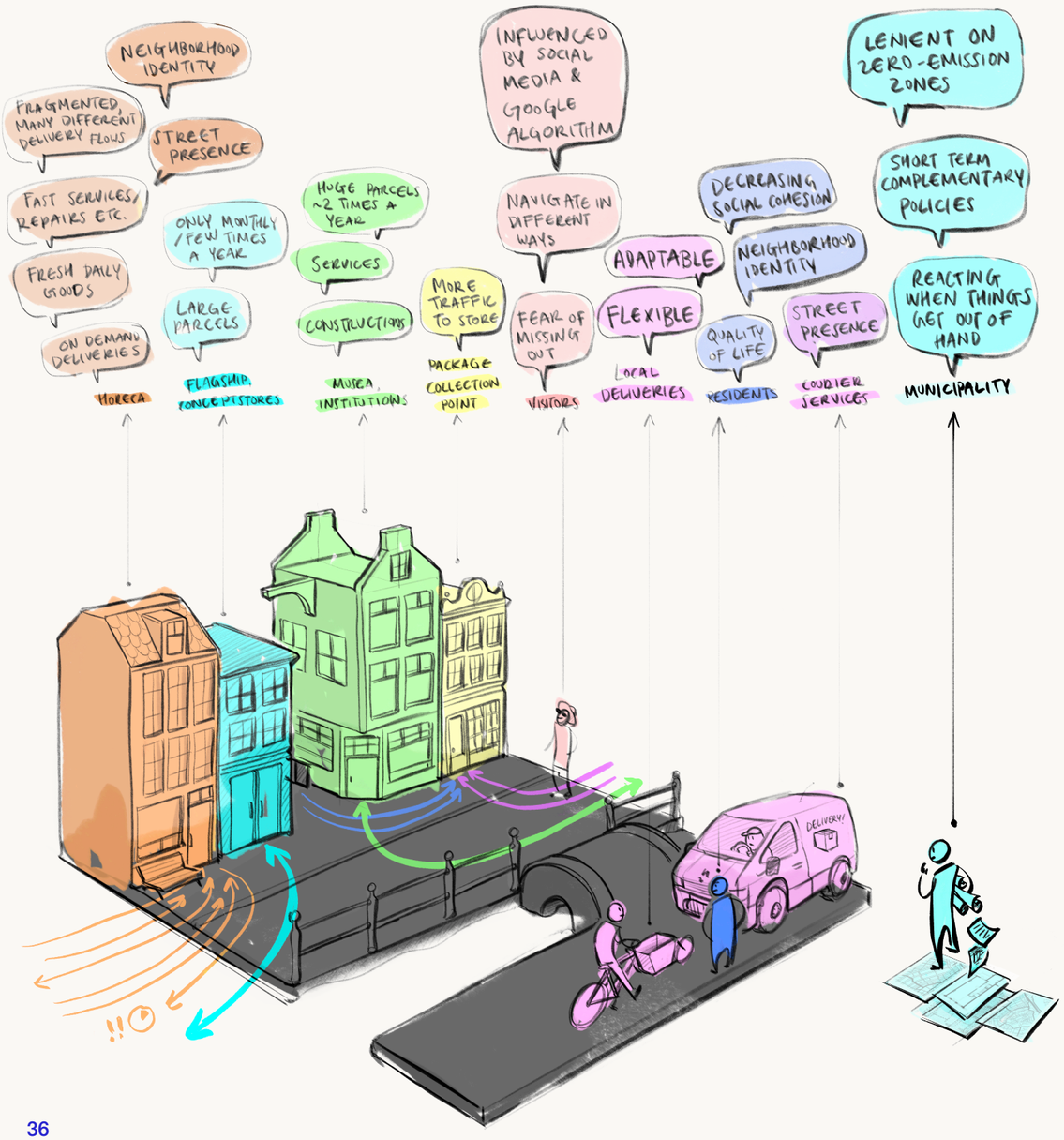
Situations like these are very common in the entire city. Let's not forget that I observed the neighborhood ‘off-season’ on a cold Monday afternoon. The street, which looks quite empty in the top image, would often be way more busy during summer, with pedestrians overflowing the sidewalks onto the road while bikes and vehicles would have to maneuver their way through. Of course, logistics flow will also increase during high season.

Knowing about the **congestion issues** in advance, this scene was not surprising. However, I witnessed it within minutes of entering the 9S neighborhood, which definitely set the scene for the challenges the city is dealing with.

(Note the pedestrian in the gray jacket cautiously looking over the sudden incoming group of cyclists, while a Bakfiets cyclist makes the mistake of trying to overtake the vans on the left side, after which the cyclist with a blue bike quickly has to react by moving to the road again to make space.)

Within the neighborhood, much of the mobility flow comes from business owners, though things run a little more complex than that. For example, there is clear distinction between how people and things move to and from Horeca (Dutch compound word for hotel, restaurant, and café), compared to, for example, concept stores.

Below, some main stakeholders and their needs are shown. Then, there is many documented perspectives from residents responding and reflecting on these flows. The municipality, on top of that, is implementing measures based on a grander vision, and responding to disturbances with mitigation policies. I've highlighted some of the stakeholders to get into in more depth on the next page.



1. Horeca

Most places that serve food have started expanding their delivery services, having delivery drivers walk in and out of the store, then delivering on small vehicles or e-bikes. At the same time, they are dependent on constant deliveries for ingredients and drinks, which all come from different sources and are delivered at all times, through different means. For example, vegetables, which are perishable, are bought from a product wholesaler and brought in a few times a week by van. But, as we can see on the right, fish is bought from a local seller such as Vishandel Tel, and delivered with their own cargobike.

Figure: While waiting at an interview location, I spot a delivery cargobike from Vishandel Tel, which the interviewee later explains is a local fishmonger in Amsterdam that supplies many of the neighborhood's restaurants.

Alcohol, another significant commodity for cafes and restaurants in the neighborhood, has an even more fragmented flow, often bought from different breweries and delivered multiple times a week. Since space is incredibly limited in the inner city, most horeca owners need to be resourceful with their storage and cannot afford to keep provisions for long, forcing them to order smaller volumes more frequently.

Lastly, services like repair and maintenance might be needed during service on the spot and as soon as possible. These service providers often have to come from outside the city center to only a specific location as soon as possible to repair equipment, usually during peak hours. S. suggested that having a neighborhood storage space equipped with repair and maintenance tools could be valuable, allowing technicians to travel to the job sites by bike from the storage unit. Anything that reduces congestion on the street.

2. Courier services

When discussing the role of courier services, for example PostNL, DHL, UPS, and other companies, S. mentioned earlier discussions she's had with their representatives and the municipality to come up with solutions for a less fragmented flow of delivery vehicles in the inner city. Currently, whether business owners and residents like it or not, when they order different items they need, they have no control over who delivers them, and even what time it arrives.

When the possibility of using white label delivery was brought up, S. states that courier services did not respond enthusiastically. With white label delivery, a single carrier combines flow of goods in the inner city for improved efficiency. This could either be organized by the municipality, or another third party.

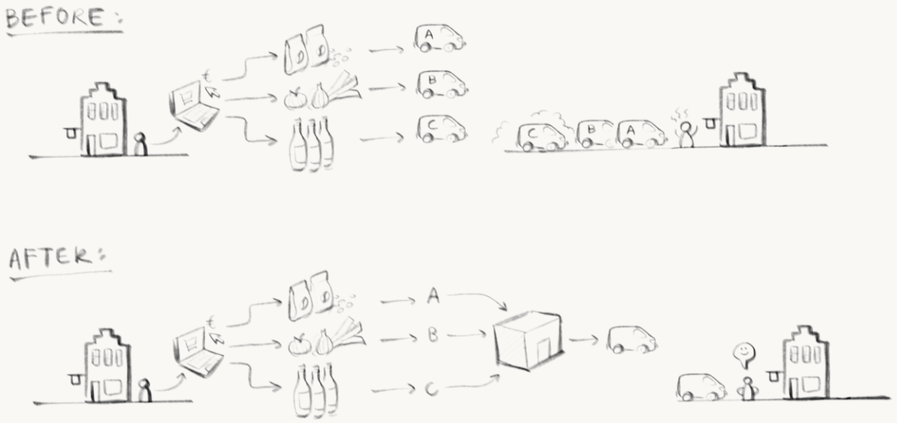


Figure: How white label delivery works, and how it could improve congestion issues.

The negative response stemmed from the fact that courier services prefer maintaining a visible presence on the street. A white label solution would eliminate their brand visibility in the busiest parts of Amsterdam. Even though S. experienced this response, the white label solution is a viable and attractive solution that is increasingly being implemented in cities through third party distribution services.

One such example, Mypup, offers deliveries through cargo bikes as well as bigger vehicles, and offers to set up pick-up points through parcel lockers. These lockers are often placed in community spaces or neighborhood resources such as shopping malls, grocery stores, or at lobbies inside larger residential buildings.

Lockers are an attractive solution that could solve multiple challenges with neighborhood logistics, which is why services like mypup are gaining traction across the country. They work with companies, municipalities and property managers to set these up and even highlight car-free, sustainable neighborhoods as part of their value proposition.

Image: While writing at the Social Hub location in Delft, I realize I've seen these lockers before. I walk to the back and lo and behold. There they are!.

3. Visitors

‘Visitors’ to Amsterdam include all individuals, such as tourists, who navigate the city for recreational purposes, without residing or working in the city. Visitors make up a huge percentage of flow inside the neighborhood, and are the biggest source of income for business owners. As mentioned before, this group regularly crowds the streets of Amsterdam, leading to disturbances for local residents. Visitors are driven by multiple sources, depending on their reason of visit or where they are from.

In terms of their movement, as observed by S., visitors tend to mostly visit the neighborhood to go to specific popular destinations. However, when we talk to [people who have visited Amsterdam before] and ask to describe their strategy for moving around, I hear other stories.

“I always allow exploration until me or my friends are hungry and then we find a place to go have food spontaneously, depending on where we are.”

Visitors/ tourists way of moving around the city is actually unique and interesting. Models exist to describe not only their (linear) movement between destinations, but also how their movement patterns from their accommodation vary based on factors such as transportation ease, personal characteristics, and knowledge about the destination.

Plans by the municipality reveal that dealing with congestion issues will entail closer monitoring and intervening before it becomes too crowded, while at the same time they want to better understand its visitors to manage the crowds.

2.3 Describing dynamicity

In the following section, I will discuss the dynamic qualities of the Negen Straatjes neighborhood which arose during the session.

2.3.1 Clashing and changing needs

An overwhelming theme that emerged during the interview was that all stakeholders involved have strong and changing needs or interests, which clashes with other stakeholders, and also diminish the livability of the neighborhood because the streets get too congested, causing overcrowding and dangerous situations. So much so that S proposed that the only solution would be strict **policy and enforcement** to keep the streets quiet. Meaning, don’t allow any vehicles outside window times, and don’t hand out exemptions. This reflects her earlier experiences, where she saw only strongly enforced rules reduced the traffic and nuisance disturbances experienced by visitors on the street.

On the flip side, it emphasizes the overwhelming **conflicting values**, seemingly so complex that only the heavy hand of the law could resolve the issue. Of course, this would solve the issue on the surface, but it's a solution that would effectively ignore the needs of residents.

S. mentions a conversation she had with a municipality official, talking about a recently implemented measure that, in her words, was not working out. To accommodate window times, service vehicles have been pulling over next to canals on the corner of the street instead of on the street itself. However, the municipality recently implemented rules that prevent heavy vehicles from doing so, to protect the increasingly fragile bricks on the canal side and bridges. When S. asked the official where service vehicles were supposed to park now, they could not provide an answer. Of course, measures need to be tried and tested. However, it would seem that a quick chat with neighborhood residents would have quickly exposed this issue.

Another much-discussed example of clashes of needs would be the “tiktokkeries” that have had a large presence in Amsterdam, but mostly in and around the 9S neighborhood. Tiktokkeries emerge when influencers on Tiktok post a video of a shop they came across, usually showing a snack or pastry that looks appetizing. This is then followed by many other users visiting the shop and filming their experience. The result is that the shop gets a substantial presence on users' feeds, and many end up visiting the store out of curiosity.

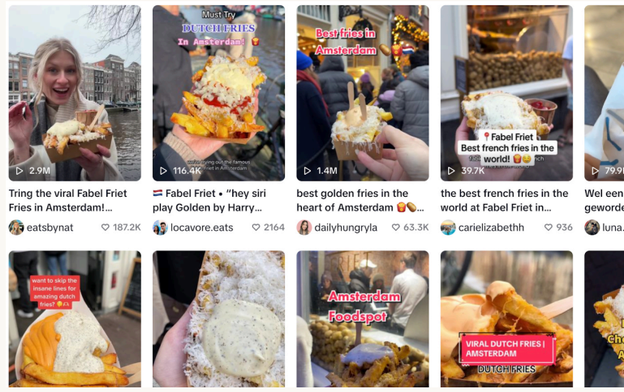


Figure: Screenshot I took on TikTok, searching ‘fabel friet’.

Figure: The cue for Fabel friet as a result of going viral on Tiktok (De Groene Amsterdammer, 2023).

"I have seen so many pictures of their food on social media by now; it has ignited a strong desire in me to actually eat their food." [translated by chatGPT] (Kuitenbrouwer, 2023)

Many newly popular shop owners are glad to see their product get popular, and the long queues on the street create a welcome street presence for them. However, as you can imagine, neighboring business owners are negatively impacted by the disruptions on the street.

On the next page, we see how 'Tiktok famous' Fabel Friet tried to deal with clashes. On the left, a sign appealing to customers to not feed seagulls, presumably a measure implemented after a plea by the municipality, both for the bird's health and to prevent seagulls from crowding the area and causing trouble. On the right, a sign posted next to a neighboring shop trying to mitigate fry-eating crowds forming, to no avail (as far as I observed). Lastly and most impressively, a crowd-controlling 'crew' worker. According to S, The shop deals with a lot of lingering crowds because customers first have to wait in line to order, then wait for their order, and then need to find a public spot to comfortably eat their fries.

Figure: Around fabel friet, multiple signs can be found. (left to right): A plea to not feed the birds, one request not to eat in front of the window, and lastly, a crew that has been hired to manage the crowds (Taken by me, 2023)

Chun, another Tiktok famous shop, this time a Korean-style sandwich cafe, directs crowds away from the shop onto a neighboring bridge, which was ordered by the municipality according to S after crowds caused too much disruption on the street. Chun deals with a different crowd, one that stays lingering on the streets for a longer time because they have to wait to be seated. QR codes linking to the menu give queueing customers the chance to decide beforehand what they want to order, to increase time efficiency once inside the cafe.

Tiktokkeries, as a phenomenon, are quite specific to this area in Amsterdam but do serve as a reflection of how a change in consumption behavior, triggered by an emerging social media platform could drastically affect mobility and street dynamics in a neighborhood, to a point where the government needs to intervene. In 2022, businesses were still recovering from Covid and the city was only just starting to fill up with visitors again. Tiktok was only just starting to get relevant in the Netherlands, and none of the currently affected shops anticipated what would happen (Stöve, 2023). Chun's owners, Melissa Cheung and Kelvin Chan, even

reflected that, when their popularity suddenly exploded, it was a difficult and stressful period, something that they did not know how to deal with.

"We even had a period when we didn't dare to enter the street. Or I would come here extra early just so I wouldn't have to pass by the queue. I was just embarrassed. It was such chaos here; we didn't have it under control at all." [translated by ChatGPT] (Stöve, 2023)

We are looking at an example where a disturbance, first only affecting a few shops, also affects the entire neighborhood. Chun's owners clearly thought the same, reflected by how they initially reacted to the situation: embarrassed, because of how much the crowds were causing a nuisance to the neighborhood.

We see the neighborhood adapt to changes quite often, which then causes a change in needs in terms of mobility. At the same time, when disturbances like these happen, there is significant outcry from in- even outside the community, pleading for the government to intervene. Suddenly, we see the community collectively aligning on their priorities. Het Parool, in 2023, collected perspectives from numerous residents and neighborhood advocates, which varied in their angle but all agreed on how the public space is deteriorating because of the tiktokkeries.

"Selfish French fry shop owners can simply ignore responsibility for the consequences of their questionable business practices. Improper use of public space, bulging trash cans, hordes of fattening people obstructing passage, normal business owners suffering: it's all possible." -P1

"TikTok is the ticking time bomb beneath the success of the 9 Streets. What was once an attractive shopping district has quickly deteriorated into a food alley. Dirty, crowded, and vulgar." - P3

"We bring it upon ourselves and collectively squander what we hold dear. I can already hear and see the Transavia planes flying overhead again. Thousands of passengers per day, we are the ones doing it ourselves!" -P4

"What to do about the TikTok queue? Perhaps it's not a matter of less but rather more. The tourist influx is unstoppable. Open more of these establishments, but somewhere with sidewalks larger than one square meter" -P6

And in a public stunt to raise awareness, one influencer from Amsterdam changed street signs to mock the people queueing. Pictured: Reestraat became Rijstraat (queue-street). Berenstraat became Schapenstraat (Bearstreet became sheepstreet.)

Figure: Still taken from news coverage on the stunt (AT5, 2023)

In the most recent manifestation of this specific clash, all stakeholders involved have arrived at quite of an impasse. Earlier this year, the municipality implemented a new rule, in which only 10 people are allowed to be queued at any business in the city. Fabel friet's owners immediately went to court, after which the judge ruled in their favor: this rule is unworkable, thus, should be suspended for the time being to prevent the business being affected during the summer peak. (Het Parool, 2024) At the same time, the article underscores the ongoing disturbances faced by residents, leading 77 of them to file formal complaints. A number of them are contemplating challenging Fabel Friet's license to operate, a move that could potentially result in the closure of the business.

Fabel Friet's owners press on the fact that they, along with the municipality, are not opposed to each other at all. They both want to come to a workable solution together, as they both recognize that the resident's quality of life is of high priority. Interestingly enough, tough, not high enough of a priority to shut down the business to prevent the expected queues during summer.

2.3.3 Social cohesion and neighborhood identity

The gentrification as mentioned previously has not only been a business strategy in the neighborhood, but has had its social effects as well. This becomes evident when we look at the 9S's history and is made even clearer by the way that S. characterizes the change, saying things like the local businesses were 'bullied away' and the original, working-class inhabitants were 'kicked out'. Hagemans describes the gentrification process in 9S and how residents and business owners have reacted to it, even causing it to some extent by branding the neighborhood themselves and making it more marketable to big corporations, which have since settled in the neighborhood in the form of flagship stores. The neighborhood picked up in popularity and has since drawn a large number of visitors and tourists from all over the Netherlands and the world. Several entrepreneurs reflected that the crowds and cues have dissuaded local customers away.

"Dutch people don't queue up for a pancake. So we lost our daily guests. If you become too busy, too popular, then the neighborhood actually rejects you a bit." -Owner 'Pancakes Amsterdam' in Negen Straatjes, Hagemans et al., 2023

At the same time, the large interest from corporations has prompted property owners to drive up the rent, sometimes even up to three times the original price, which led to social ties between entrepreneurs eroding and local businesses to close up shop.

The resident's demography has also evolved over time, first consisting of the working class who then migrated to more affordable cities like Almere (036 represent). Later, a shift occurred with the emergence of what S. labels as "Hippies" - upper-middle-class individuals attracted to the quirky shops. Currently, there are a greater number of expats and second homes for the upper crust of society, who don't consistently occupy the property. In a sense, throughout the ages, the neighborhood's identity seems to have changed.

To the business owners, as well as residents, the identity of the neighborhood matters a lot. To both of them it adds a sense of pride, and business owners understand that the type of visitors they attract will be greatly influenced by the neighborhood's shared identity. If the neighborhood is slowly turning upscale, becoming famous for hosting international luxury brands, it will attract a certain crowd. This same crowd will in turn be unlikely to take an interest in your shop that sells quirky handmade jewelry, which will impact your sales. Back in 2015, Pinkster and Boterman conducted several interviews with long term residents in the western part of the canal belt, which includes the 9S. Almost all of them moved into the area at the start of their career, characterize themself as upper middle class, and, as the paper so aptly describes, they embody the incumbent ‘upgrading’ of the area. They mention the liveliness and bustle of the streets, specifically appreciating the **dynamic urban atmosphere**.

Additionally, the enormous crowds attracted to the tiktok famous shops are perceived as **harmful to the neighborhoods identity** by residents and the shop owners. In previous interviews, shop owners were very opinionated about how the crowds move in the city. While clearly disliking the constant congested streets, they had something to say about the speed as well. Fast moving crowds makes them feel like the neighborhood is not appreciated, properly experienced. But slow-moving people make the streets seem more like a ‘museum’ than an active, alive part of the city. The museum analogy was mentioned again by Pinkster and Boterman, as well as the theme park, which has manifested itself due to the typical rowdy red light district crowds spilling over to the canal belt, as well as visitors doing activities which in the respondents eyes are inauthentic, like beer bikes and other noisy forms of ‘banal entertainment’.

The **lack of social cohesion** is very evident and pressing in the neighborhood, which S. immediately mentioned at the top of the interview, and was a recurring theme found in earlier research. Pinkster et al. even observed residents’ reluctance to call the area a ‘neighborhood’, as the term is supposedly associated with neighborliness, a community, which the respondents describe as fitting for a suburb, but not the inner city of Amsterdam.

This matters for our context because the C&C mobility hub aims to be a space where a community can come together to start initiatives related to mobility. A lack of social cohesion adds another challenging element to the context. However, it could also be a slippery slope in terms of setting the scope for my project: the lack of “community feeling” in gentrified neighborhoods is a well-observed and complex phenomenon, and ‘solving’ it would take an overwhelming space in the project. The consensus is that solving the negative social consequences of gentrification is best done through legislation and housing strategies (Lubell, 2016). However, active participation in the community also has a positive effect on social cohesion in gentrified neighborhoods. The hub’s intelligent layer could play a role in facilitating this participation, so it’s definitely something I should keep in mind.

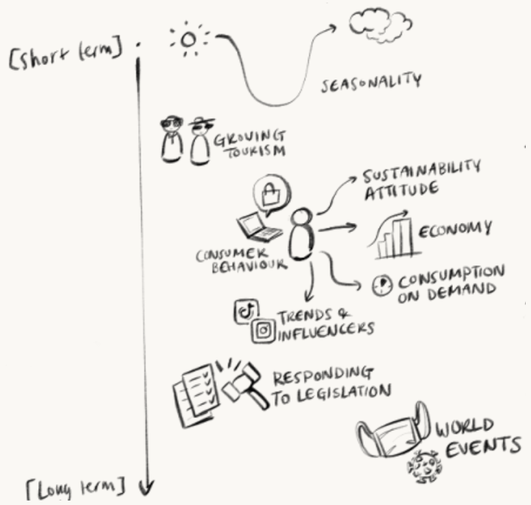
2.4 Conclusion: Stakeholder map & Dynamicity

"Trends happen so fast, it's just not as effective to react to the effect- because they basically happen overnight." -S.

The Negen Straatjes is in a tough spot. Amid a surge in tourism that surpasses pre-pandemic levels, the neighborhood, along with the rest of the city, is navigating a significant transition as Amsterdam moves toward becoming a car-free city. Simultaneously, they are grappling with the persistent disruptions fueled by social media, which drives crowds to a concentrated area, creating considerable disturbances for the locals. The neighborhood is hugely dynamic in many ways, which affects all stakeholders, but mainly the business owners and residents. Bigger trends in society and other drivers move legislation which impacts which the business owners have to react and adapt to, which is often difficult or even impossible to do.

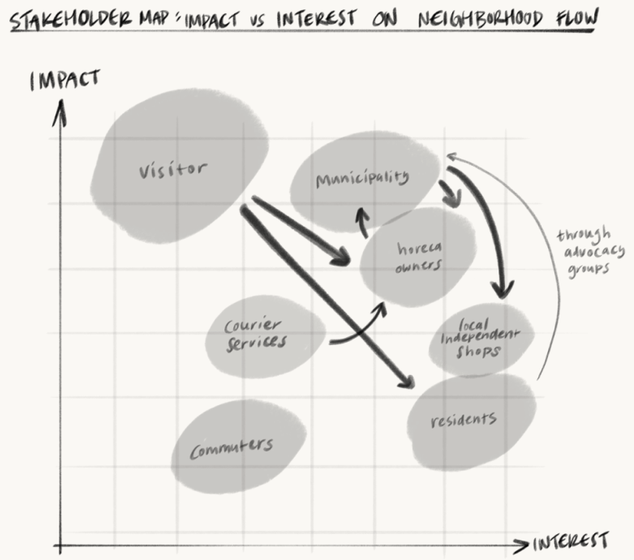
Entrepreneurs in 9S face constantly changing needs that impact mobility and neighborhood flow. These shifts are influenced by various factors, including seasonality, growing tourism, evolving consumer behavior, and local legislation. Economic trends, sustainability demands, and global events like the COVID-19 pandemic also shape their operations and affect the flow of goods.

The second element is identity. Over the years, shifts in demographics, retail types, and branding efforts have reshaped how residents and entrepreneurs perceive the neighborhood. While both groups now have a strong sense of identity tied to the area, the growing number of visitors—who often engage with the space undesirably—has disrupted this cherished perception, altering their relationship with the neighborhood.



The final stakeholder map on the next page showcases a high interest in the flow for business owners and residents, with less power for them to influence themselves. Specifically in the case of them 'impacting' the municipality, in essence it means they are not able to effectively advocate for themselves. At the same time, we see the tourists and visitors having a lot of high impact on the municipality and business owners/residents directly, while there is seemingly no way to impact them back. There is an imbalance in impact, with visitors holding a significant, disproportionate amount of it.

What I want to illustrate using this map is that, in this context, considering the dynamicity of the neighborhood and the type and volume of impact the stakeholders have on each other, participation is not always as simple as bringing everyone to the table and trying to incorporate all the perspectives equally. The consequences of the disturbances and changes happening in the area trickle down to the residents of the area, which most significant stakeholders



(municipality, visitors, entrepreneurs) agree should be placed as high priority.

'People say things like: the canal belt belongs to everyone. But that does not feel right. There are people here who moved in all those years ago when nobody wanted to live here. Do they get pushed aside? No! Those people made this place what it is. So beautiful, and so liveable. That deserves respect and support.' -Resident in Canal belt area in Amsterdam (Pinkster & Boterman, 2017)

At the same time, you have this situation where stakeholders are responding to each other, especially local entrepreneurs who are responding to visitor behavior changes, and also municipality measures who are in turn responding to visitors as well.

So an immediate concern regarding designing an agent that serves this neighborhood is- Who does it serve? Who owns it? Like AI accountability, if you will. Can we design an agent that somehow serves everyone, or should someone have priority? Designing just a feedback enabling AI agent for a community comes with challenges: If you just capture the changing needs of entrepreneurs and residents, you will be playing catch-up forever.

I previously concluded that building a resilient mobility infrastructure requires dynamic stability, which could be achieved through a feedback loop. I thought a conversational agent would be a strong fit for this role, as it could engage the community and sustain that engagement even after implementation. However, as I researched the area further, I realized things are more complicated. The neighborhood and community needs constantly influence each other in different ways, making it impossible to focus on just one aspect. Diving into the context of the Negen Straatjes made me consider the need for an intelligent layer that addresses the broader mobility system, not just a single hub.

Before finally defining an appropriate role, I decided to take a bit of a detour first, through two explorations.

3. Exploring the role for AI for a dynamically stable Negen straatjes

This chapter lays out two branches of explorations (or foci) I did following the previous context research. We ended on quite a complicated conclusion, which needed to be simplified or captured. I tried to do this by simply starting from two potential roles for AI and exploring and reflecting on them, before choosing a final direction.

With regards to AI accountability, I frame the stakeholders in both explorations a little bit as in- and outsiders. Or community and non-community.

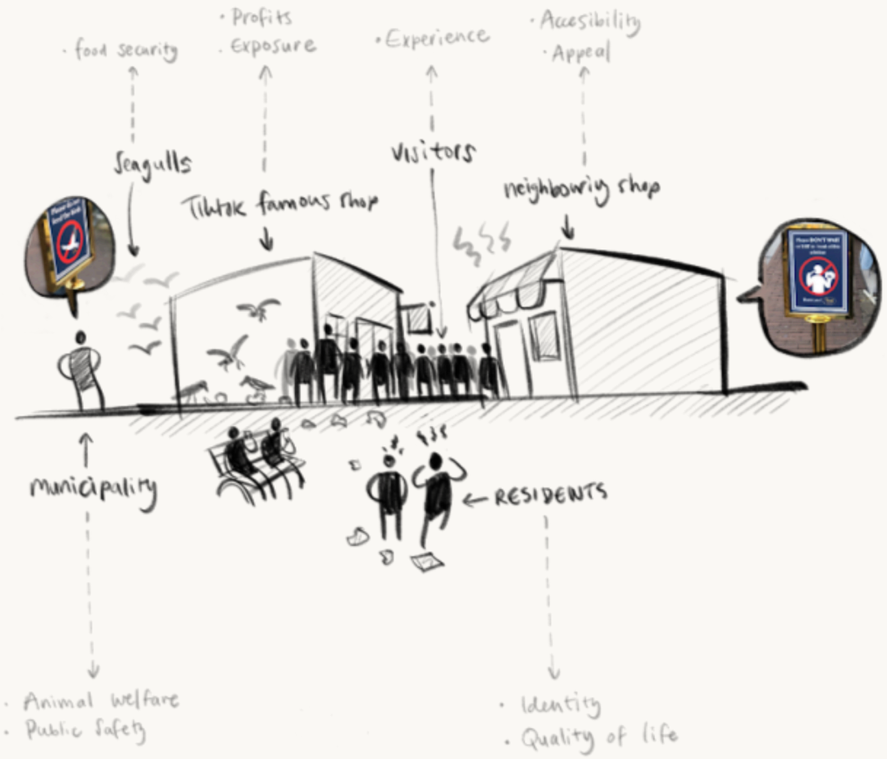
3.1 Focus 1: The AI agent as an advocate for community values

In the first focus, we explore the AI agent as an advocate for community values. What if, regardless of the agent's exact practical purpose, new ideas or initiatives need to be set up and discussed through the community agent, which operates under pre-determined community values?

It seems like the neighborhood either aligns on values or at least understands and respects the community values once a disturbance happens, but it is difficult to align on actual, actionable solutions. This subchapter starts with the question: What if the agent mediates with stakeholders and advocates for the shared community values in the neighborhood, as a way to accommodate dynamic needs while still making sure the neighborhood values are represented?

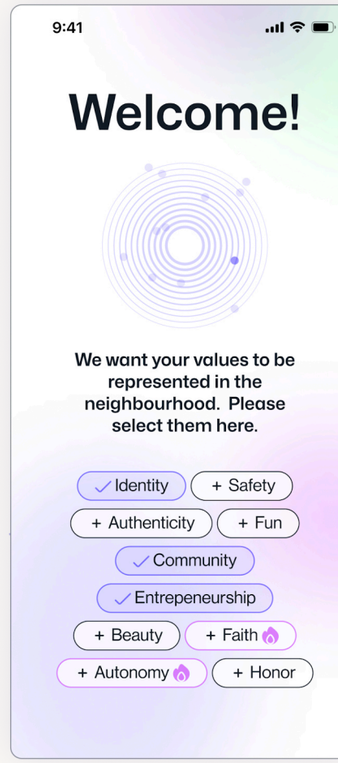
Here, the agent could serve anyone, however, in a way still 'serve' the community.

To understand what I mean by values, I've laid out the tiktok queues scene I witnessed with a new lens: as value tensions. Here, the reason this issue is hard to solve is because the underlying values that drive stakeholder's needs are clashing. For example, while visitors are driven by finding a meaningful experience, the tiktok famous shop might be appreciative of the exposure and value the potential profits that come out of that. At the same time, the municipality might be seeing this scene as potentially harming public safety, and residents their quality of life, as well as their neighborhood identity. Value tensions are hard to solve, but could be navigated if we identify and prioritize those that serve the community the most. In case of tiktok queues, it might be 'liveliness', or 'accessibility', which are values tied to the identity of the negen straatjes neighborhood and valued by both residents and local business owners. Queues clog up the street and ruin those aspects of the neighborhood. An intelligent layer that prioritizes these values might redirect visitors when it gets too crowded or suggest alternative places to eat once visitors arrive at, lets say, a mobility hub.



The image below shows a simple vision showcasing the role the agent could play in the neighborhood. In essence, the idea is that stakeholders are able to start initiatives using the hub's resources, and the agent would make sure these initiatives would be benchmarked against the values.

But a lot of questions then arise: How do you even capture these community values, and how does the agent's decision making based on them even translate to the real world? Above, you can see a mockup of a platform that tries to engage with 'users' to capture their values. In reality, I assume this will be far more complicated.



3.1.1 Code the streets: designing the Intelligent layer for Amsterdam

In an interview on the Metropolitan Mobility Podcast, Debbie Dekkers, Innovation Manager working on **Code the Streets** at the Municipality of Amsterdam, shared her vision for smart mobility. She proposed that integration of smart technologies could drastically change how we organize mobility and even infrastructure today." (2023) During the podcast, the hosts and Dekkers specifically highlight the congestion caused by busy logistics on the streets, emphasizing that measures such as window times, meant to quiet down the streets during the day, only worsened the situation. This is because all activities are concentrated within specific time frames, resulting in increased street congestion.

Residents and entrepreneurs would have even less control over when services or deliveries would arrive, not only because of the window times but also because of the disruptive congestion. If we add an intelligent layer into the mix, a new situation would arise where all streams are more evenly spread out. Shop owners could then schedule convenient times based on availability, even coordinating pickup times with other businesses.

She argued infrastructure in a way would become flexible, instead of a rigid implementation that would remain unchanged for 20 years, which is the reality right now.

The way Dekkers describes the role intelligence can play aligns with a general vision I've seen when publications describe smart cities. The city collects data in the physical layer, which the intelligent layer uses to make decisions, orchestrating the flows and functions of the city.

Code the streets is another project set up by EIT, together with AMS and several partners and cities across Europe. They explore smart urban mobility management, with traffic reduction in Amsterdam specifically in mind. AMS explores ways to motivate drivers to choose alternative routes, based on collective benefits. Because there seems to be a common ground with my current focus, that of using an intelligent layer which advocates for community values, which seems similar to their concept of collective benefits, I spoke to F., who manages the project at AMS, to discuss this angle.

In the interview, we discussed the concept of shared community values as well as dynamicity. Values, including so-called "community values," are dynamic rather than fixed. Designing intelligence with a focus on values requires experimentation, especially considering the ethical implications of socially disruptive technologies. While participatory approaches are ideal, they are difficult to achieve, as people may not always be motivated to engage. This brings up the challenge of autonomy: how much decision-making should be entrusted to citizens? With the project at AMS, they use Value Sensitive Design (VSD), which offers a framework to integrate collective perspectives into intelligent decision-making, aiming to balance these complex dynamics.

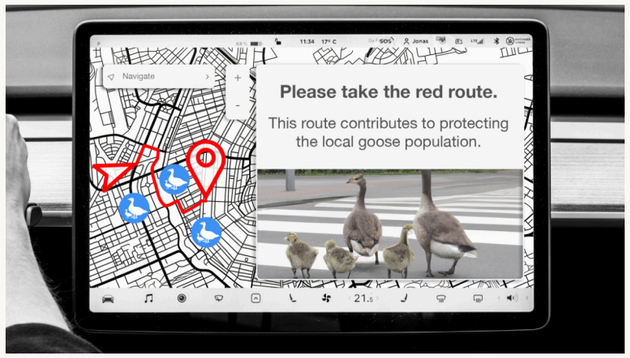
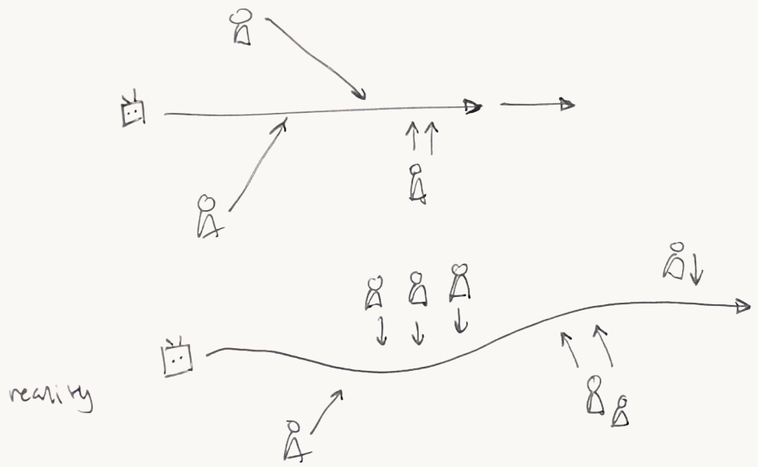


Figure: An example on nudging drivers based on collective values: the choice is still with the driver to change their route. (Responsible Sensing Lab (RSL), 2024)

3.1.2 Main insights



Designing with community values in mind to act as a semi static, binding layer to deal with dynamic needs might be challenging, as these values also change over time. However, in terms of an approach to intelligent mobility orchestration, it is promising. Instead of this vision I kept seeing, where the intelligent layer conducts an almost invisible orchestration of mobility, some autonomy is left to the drivers themselves, where they can choose to engage and make decisions for themselves. At the same time, collective values are used to narrow down the choices to ones that align with the city's goals.

VSD as a framework connects my previous insights on value tensions with responsible AI design. It's a way to simplify decision making while serving the community.

3.2 Focus 2: Reflecting on the agent as a manager: the public space as a commons

In this second focus, I try to apply the VSD approach in a more grounded way.

Many of the observed tensions on the streets revolve around the public space. Even when it's for a short moment, like when I noticed the congestion of service vehicles and the crowd of pedestrians and bikers who almost collided, struggling to move through each other's paths. The public space, in this case the road, is shaped and pre-defined in a way that steers people and vehicles to move within certain boundaries. Bikers on the bike lane, pedestrians on the sidewalk. However, when a disturbance happens, we are forced to move outside those boundaries, which leads to dangerous situations.

Let's say we remove those boundaries, meaning we allow for free flow of all commodities within the space. This idea is not new. The 'shared space' is an urban planning strategy that is meant to create inclusive public spaces that are more pedestrian friendly. It emerged as a reaction to car-centered cities which often prioritized vehicles over people, leading to less hospitable public environments.

By removing aforementioned boundaries like curbs and sidewalks, the space becomes more inviting, and responsibility is shared among all modalities. In practice, many European cities are implementing this strategy, with Dutch cities like Utrecht being at the forefront. The inner city of Utrecht, much like Amsterdam, is going through a car free transition. Again, like Amsterdam, they experience traffic congestion in the, with vehicles supporting logistics clogging up the streets. However, by implementing measures around offloading goods and by leveling the street surface evenly, they were able to successfully mitigate most of these congestion issues.

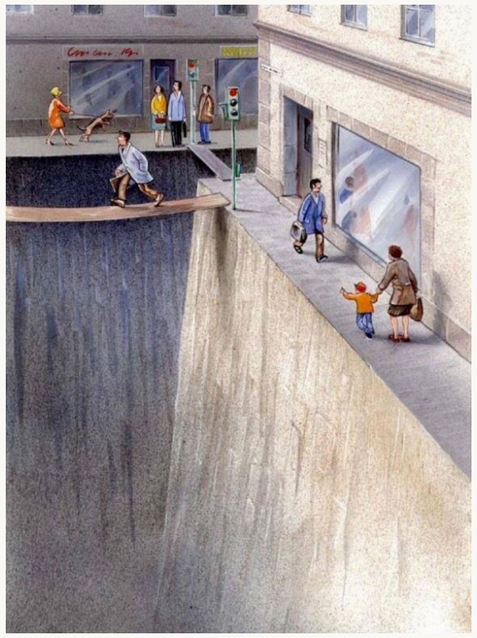


Figure: Illustration by Karl Jilg, commissioned by the Swedish Road Administration (2014)

Figure: Zadelstraat in Utrecht (DUIC, 2018)

Figure: Shared space experiment in Negen Straatjes, taken by Kruyswijk for Het Parool (2020)

While shared spaces are a factor, Utrecht's success is attributable to a broader range of strategies they deployed. When we compare Utrecht and Amsterdam, we should also recognize that Amsterdam's situation is much more challenging. Utrecht does not face the same space constraints or dynamic nature as the inner city of Amsterdam, which often leads to unmanageable crowds.

In Amsterdam, in the Negen Straatjes area even, the concept of shared space has been tried and tested in the context of the covid-19 lockdown, in an attempt to make it easier for pedestrians to practice social distancing. This experiment had a short and well-documented run.

Meant as a temporary measure, the municipality never changed the street surface. Instead, they spray painted the ground to declare its new designation. Entrepreneurs responded enthusiastically at first. If pedestrians don't have to use the sidewalk, this opens up some space for horeca to add a terrace, especially in the evenings when other shops are closed. However, local residents immediately expressed concerns regarding the safety of children in particular, having to share a space with faster moving vehicles, and their concerns quickly proved to be accurate: dangerous situations quickly emerged where bikers and pedestrians, now sharing the same space, got in each other's way and would regularly collide. As a response, speed bumps were placed by municipality officials. Again, the response by the community was critical. The ramp would obviously be dangerous for bikers.

Figure: A biker recovering from a fall. Captured by Negen straatjes resident. (NOS, 2021)

As predicted, accidents soon occurred. The speed bumps, designed for heavy vehicles, proved to be a hazard for cyclists, who frequently tripped over them. After only one week, the bumps were removed, and the shared space initiative was abandoned.

On a surface level, this case looks like a massive failure: municipality officials never communicated with residents, implemented measures that affected them and the safety of the neighborhood as a whole, and predictable problems quickly surfaced, after which the entire initiative had to be canceled. However, the reactions it provoked provided some valuable insights. As I said before, the experiment was well documented, as community members in Negen straatjes - residents and entrepreneurs- are very vocal and expressed their willingness to think along with the problem through local news media.

Their responses were insightful because they showed their willingness to participate in a solution as a community, while having a positive attitude towards a flexible use of public space. Of course, as long as public safety, a shared and foundational value among all stakeholders, was taken into account.

This prompted my second exploration: what if intelligence could play a role in opening up new possibilities and solutions with the scarce public space in Amsterdam? What if the intelligent layer somehow unlocks a dynamic dimension to an otherwise static infrastructure?

Figure: AI proposes a different use of space, using data derived from crowd monitoring and some kind of undefined data enrichment: It knows benches are less occupied when it's cold, and that there is a need for christmas tree collection points around the same time in the neighborhood.

3.2.1 Designing Digital platforms for resource communities

During this exploration, I have framed the public space as a resource to be shared and managed by the community, where intelligence could play a role aiding this management.

As a concept, this was derived from Charging the commons, a research project which investigates designing digital platforms for communities that share resources, or commons. A commons is a resource that is shared by a community, rather than a single entity. Some examples include natural resources like forests, but also other physical spaces like community gardens and parks. The concept of a commons also includes a collective management of sorts, where that be through institutional arrangements such as a government, or, like mentioned earlier, a digital platform.

Cila et. al state that a well-functioning urban commons requires a strong foundation of articulated and implemented shared values. They introduce design dilemmas as a framework specifically to deal with conflicting values, meaning conflict between the community and the possible application of ‘new technologies’, such as AI. (2020) The design dilemmas are a set of conflicting values, which have been derived from affordances offered by blockchain technology.

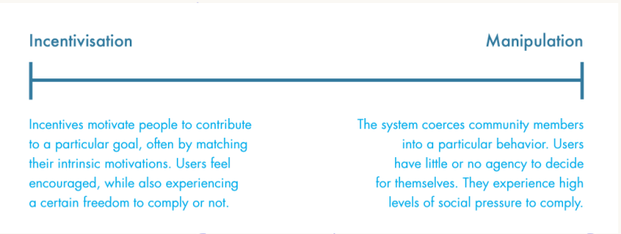


Figure: Example of a design dilemma: Incentivisation vs Manipulation (circulateproject, 2021)

I’ve highlighted the dilemma above to explain what we mean: Let's say we want community members to exert certain behavior using AI: there are two conflicting values that arise, which would change the approach you might take in designing the service. Basically, this spectrum is how much community members value agency in their own decision making. Should we offer incentives to encourage motivation for certain behaviors, while still allowing community members the freedom to comply? Or, is it more important for them for the desired behavior to be enforced, through manipulation? Both might be valid approaches depending on the community’s shared values, and possible to introduce through a digital platform or service.

The reason for involving this framework is because on one hand it combines multiple themes that have emerged during the earlier explorations: an intelligent layer that community members can interact with, or use, to set up initiatives and manage the public space whose usage and functions are constantly evolving to meet the changing needs of the dynamic nature of the neighborhood, while using the shared neighborhood values as a benchmark. While on the other hand, it tackles the element of responsible use of AI in a public context, by properly reflecting on technology’s affordances and testing them against the community’s values. Essentially, it’s a way to apply VSD to our context.

3.2.2 Negen Straatjes Observations: finding a leverage point

Before we can actually apply this framework towards an actionable intervention, I need to address a hole in this story. Until now, I have attributed the resource, the public space, to be owned by the community, the residents and local entrepreneurs, who are most impacted by the changes in mobility flow in the neighborhood.

However, with the current structure in place, public spaces, which are commons, are already owned and managed by the government. The idea behind this structure is that lawmakers and civil servants employ a public space management strategy that is not only informed by public engagement, but also government goals, expert knowledge and historical/cultural context. Any intervention introduced alongside this, in this case some kind of intelligent public space usage management platform, must offer meaningful value and be practically feasible. At the same time, we should take a look at the role of visitors. They don’t own the space (or do they?), but definitely use it a lot. If you manage its usage, they should somehow be involved as well.

In this round of observations, I took to the streets of the Negen straatjes neighborhood to explore how everyone uses the public space, if there are any tensions between its intended use and how it's used, et cetera. The purpose is to discover a leverage point, but the method is not focused on a specific direction. Based on these observations I did a quick investigation into Amsterdam’s public space plans in and around the neighborhood.

Walking around, it struck me how many forms of flexible or repurposed space use I saw. Clearly this is already a well-established part of the city. From recently implemented dedicated shared vehicle spots, to horeca terraces that are stowed away during off-hours. I even saw dedicated parking/locking spaces for mobility scooters, clearly added after it was requested by disabled neighborhood residents. This paints a picture of a city’s infrastructure already adapting over time, according to the needs of the community.

Another phenomenon that stands out is improvised public seating spread around the city, especially close to the canals. These are often secured by bike locks to lampposts or trees. In one particular case, I saw a bench secured to a large planter with a sign next to a houseboat. This sign is commonly found in private parks or nature sites, stating its a private area that has been opened up to the public, as long as you abide by the listed rules (don't enter with a loose dog, large vehicle or horse, don't play an instrument, etc). It might be meant somewhat ironically, placed in about 1 m2 of 'private space', but it clearly states the intention of whoever put it there, and perhaps of anyone who puts up a bench in public in Amsterdam: anyone is free to take a seat, as long as you treat it properly.

Lastly, I also captured a common sight: visitors using any 'sittable' surface to finish a snack or take a break, close to hotspots and popular areas.

3.3 Discussion

The residents in Negen straatjes take an **autonomous approach** towards the public space. Seeing how they improvise public seating, place potted plants, hang up their own signs to announce social rules regarding those benches, if I would guess their community values, they would probably be **collective responsibility** and **mutual respect** or trust.

The Amsterdam municipality's agenda focuses on minimizing congestion by discouraging pedestrians from lingering on the street, while also redesigning the area around the canals to improve overall livability by creating more space for pedestrians and improving accessibility. This is somewhat contradictory, because a livable space actually needs friction, resting places, to be able to stand still for a moment. They acknowledge this in their renovation inspiration document, stating the importance of a 'space for sitting and staying' for their redesign. (Gemeente Amsterdam, 2021)

If we take a look at the Herengracht, we can see that there were plans to add benches in place of parking spots, but as of right now, these are still missing. A quick investigation reveals the renovation of this street is highly debated among residents and experts. Some applauding the current lack of seating, fearing loiterers such as tourists, young people and people experiencing homelessness. Others criticize it, saying the public space has become a private terrace of sorts, and that the current layout does not align with the historical appearance and identity of the Herengracht. (Maas, 2024). The lack of trees and seating would be the result of residents protesting the plans, and the municipality conceding to it- for now. Van Ditzhuyzen, Dutch architect, researcher, and frequent commenter on public spaces and defensive urbanism, reacts similarly to the current state of the Herengracht on her blog. She states that municipalities have a task to create inclusive cities, which means prioritizing collective interest over individual ones. The current implementation does not reflect that. (van Ditzhuyzen, 2024)

Figure: Top left image: Herengracht before renovations (Matchoffice, n.d.) Top right image: Herengracht renovation plan (Gemeente Amsterdam, 2021) Bottom image: implementation, as of june 2024 (Koolbergen for Het Parool, 2024)

In any case, I don't believe the Herengracht situation should be seen as the new status quo for Amsterdam's canal streets just yet. This is the first street to be renovated, and the reactions from the public are clearly being monitored and taken into account. Who knows how the municipality will ultimately respond. However, this situation, along with the shared spaces experiment, show that sometimes creating resilient solutions is more about which lens you choose to look at the context and the problem. Being uninformed skews the lens, and makes for mismatched solutions.

Reflecting back on the framework and its design dilemma's, I've realized that it's very challenging to define a single 'community' to design for in this context. The public space somehow belongs to everyone and no-one at the same time. Making a public space less accessible to visitors only exacerbates congestion issues, even though it makes the space seemingly more desirable to residents, according to them. It's kind of like a NIMFY (Not In My Front Yard, ha ha) situation, and maybe this is why using shared values as a binding mechanism would be incredibly challenging. We can hold a certain value, believe something is important for the community, but once it conflicts with our immediate concerns, our priorities suddenly change.

The initial idea behind using shared values was to use them as a way for AI to properly navigate new solutions according to changing and conflicting needs, which would still fit the neighborhood. I still believe this is a valuable direction for further research, but keeping this dimension will be too complex within the scope of this project.

The Negen straatjes neighborhood is already actively adapting the use of space, making their own rules, even changing its meaning, it's **part of its established culture**. But the visitor's behavior seems rigid in comparison, which leads to congestion and overcrowding. Instead of intervening by designating flexible spaces to be managed through a platform, it makes more sense to **encourage flexible use of the space** through changes in visitor behavior. From their perspective, the city probably seems more limited than it actually is. Whatever impacts their decision making process during the trip, it leads to them staying at and in close proximity to certain hotspots, which we also know randomly change or pop up, partly based on whatever happens to trend on social media. On the other side of it, a local community which is engaged, and incredibly dependent on visitors' needs and behavior.

3.4 Conclusion: AI to support bottom-up mobility orchestration

The municipality's current mobility strategies in the Negen Straatjes have faced criticism and even legal challenges because they failed to incorporate input from affected stakeholders. Reactive measures, like restrictions on TikTok-driven crowds, and last-minute changes to renovation plans exemplify this top-down approach. While it's impossible to satisfy everyone, achieving a resilient and stable solution requires prioritizing the grassroots context and needs, meaning, from the **bottom-up.**

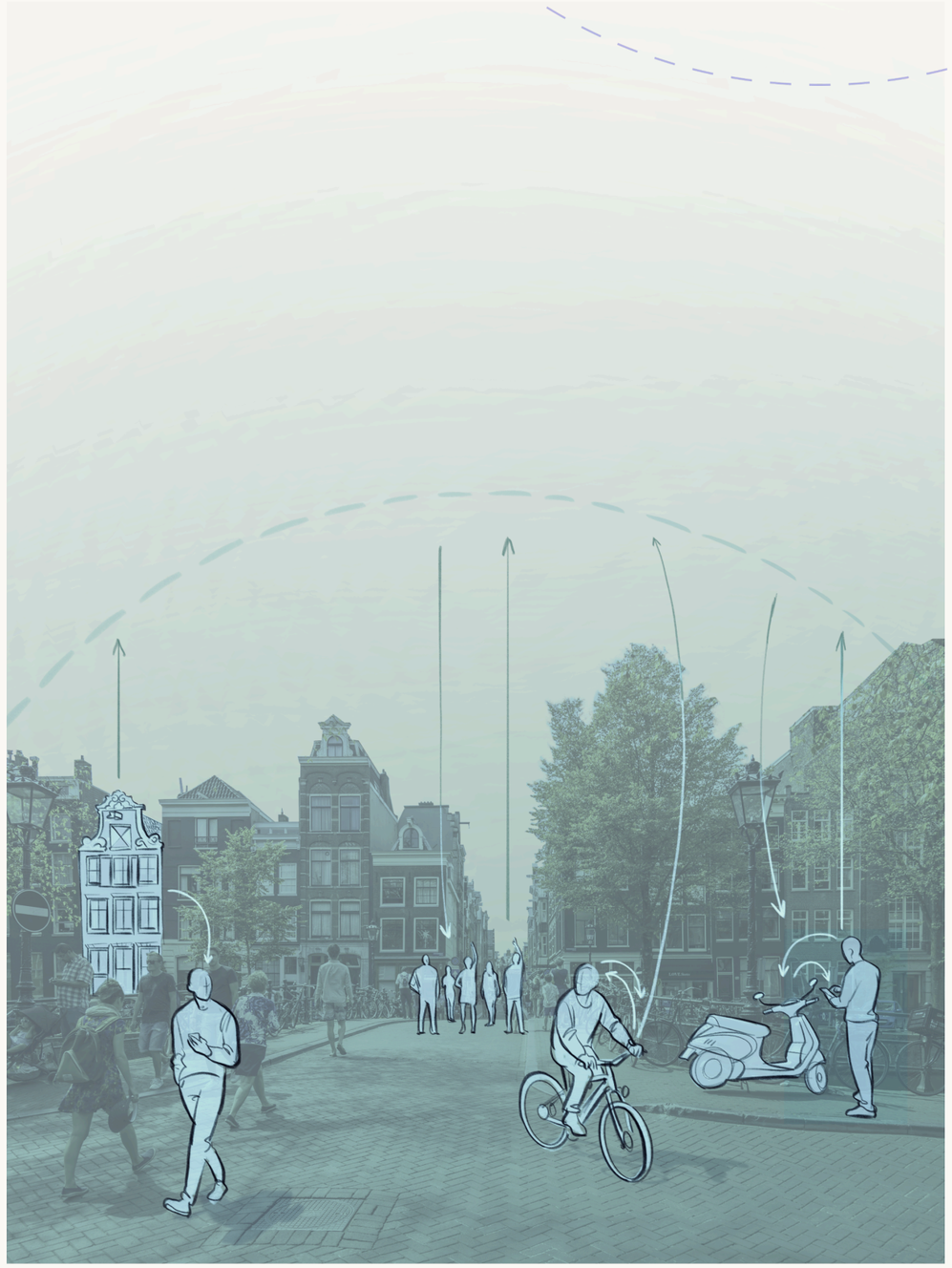
If we look back at the affordances for AI (Ch.1.5), here lies an opportunity for the role for AI to support this structure.

Let's say we engage people directly through a conversational agent, and the agent's system uses those conversations to learn and adapt over time and gets a context-rich view of a situation. It could establish dynamic feedback loops between users and the system, where every interaction—be it a visitor's journey through the neighborhood or a business's adaptation to foot traffic—feeds back into the system, refining its understanding and improving its ability to support the community's goals.

People interact with touchpoints through intuitive exchanges, where the agent initiates guidance or suggestions at just the right moments. These interactions should be designed to feel natural and aligned with their context and needs, and invite them to add to the system.

What can be done with the data depends entirely on what type of data it collects and what we permit it to do with that data. However, the ideal outcome would be that relevant stakeholders such as citizens and local entrepreneurs could actively participate, exploring the insights and co-create new services or solutions.

In the next chapter I explore the possibilities with this role for AI, and round up the insights into a final conceptual model.



4. Grounded Intervention development

Within the scope of this project, it makes sense to translate this role into an intervention that fits the Negen Straatjes, as it allows for a deeper exploration of the vision while also providing a means to validate its impact in context. This was done through a rapid 'grounded' intervention development, exploring the value a conversational agent could provide which would contribute to a bottom-up approach.

Amsterdam has been publishing plans on smart mobility in their city for years. In many cases, the focus is on streamlining the process of going from point A to point B, assuming someone already knows where they are going. However, in our context, you then miss a perspective, that of a huge part of flow in the city: people who walk around without always having a clear goal, and who tend to wander around, which, as I described in chapter 2, is the case for many visitors. Solutions for overcrowding proposed by the municipality are mainly based on crowd monitoring, trying to steer visitors before they get out of control. People are drawn to certain places by various factors that are unpredictable and constantly changing (dynamic), which is not well understood by both the city and its inhabitants, but inferred to be part of the solution, which is why it works well as a leverage point.

To get to a grounded intervention, I have to go through a rapid process of 'understanding' the visitors while designing. The goal is to gain understanding of the decision making process for visitors in Amsterdam, while exploring how an AI agent might have a meaningful impact in this context.

4.1 Method

I have laid out my activities in a linear way, but it should be noted that nothing about this process was linear. There were multiple branches of processes going on, a few of which I went back and forth on, and one of which led to the final intervention.

The starting point for ideation was using an analogy to give myself anything to hold on to. This analogy was actually used to come up with three different contexts where the role for a supporting AI for a bottom-up structure would be meaningful. One of those contexts, the visitor itinerary planner, quickly showed promise, thus that direction was chosen.

I then started with gathering a wide range of practical insights into how people plan city trips in general, as well as how they remember planning a trip to Amsterdam the first time they got here. This was done through a survey to get a broader overview and practical understanding before delving deeper. However, there were some mandatory open ended questions for participants to share their experience, to get a better sense of the context. The survey was shared through numerous public whatsapp groups.

Then, I crafted scenarios based on short-form interviews and conversations, focusing on situations people encountered during a holiday or trip that sparked inspiration, while also being relevant for visitors in Amsterdam. I then prepared possible interactions or concepts to fit these scenarios and created lo-fi prototypes for some of them, such as phone screens. To gather insights, I ran three sessions while walking 'in-context', through the city. Using the collected insights, I updated the concepts and prototypes. I then conducted three interviews with new participants to discuss the prototypes, redesigning or adding elements when appropriate based on the conversation.

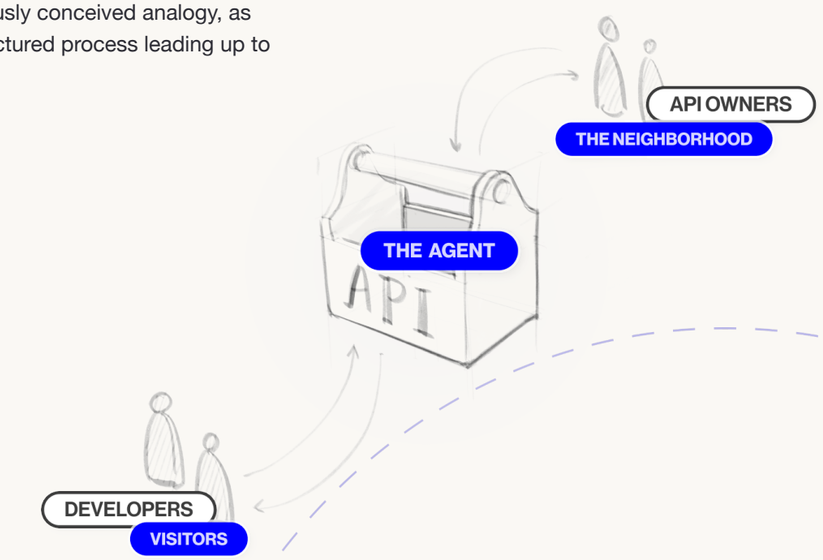
The resulting Interactions were 'captured' in scenario's, and the conclusions were used to compile a final conceptual model.

4.2 Ideating Intervention approaches

This 'development process' was hardly structured, but I've captured a single process that led to the final result. This involved using an analogy to tie the leverage point and 'bottom-up' vision together. We start this section with a spontaneously conceived analogy, as there was no structured process leading up to it.

4.2.1 From API Analogy to starting user flow

An Application Programming Interface, or API, is kind of a toolbox for developers of one program to request data or a functionality from another program. This toolbox is dynamic, constantly updating and changing, partly based on feedback and needs of developers, but also on the goals of the toolbox 'owners'. For example, if you want to develop a platform for discovering local events, you as the developer could use the Google 'Places' API to use data on venue locations, details like opening hours and reviews, and photos posted on google maps. This time, the toolbox provides ways to access, filter and format the data in the way you need. If we use the toolbox as an analogy for whatever service an AI agent provides, we can translate that into an intervention that fits the visitors, while ensuring it's being managed and 'owned' by the neighborhood.

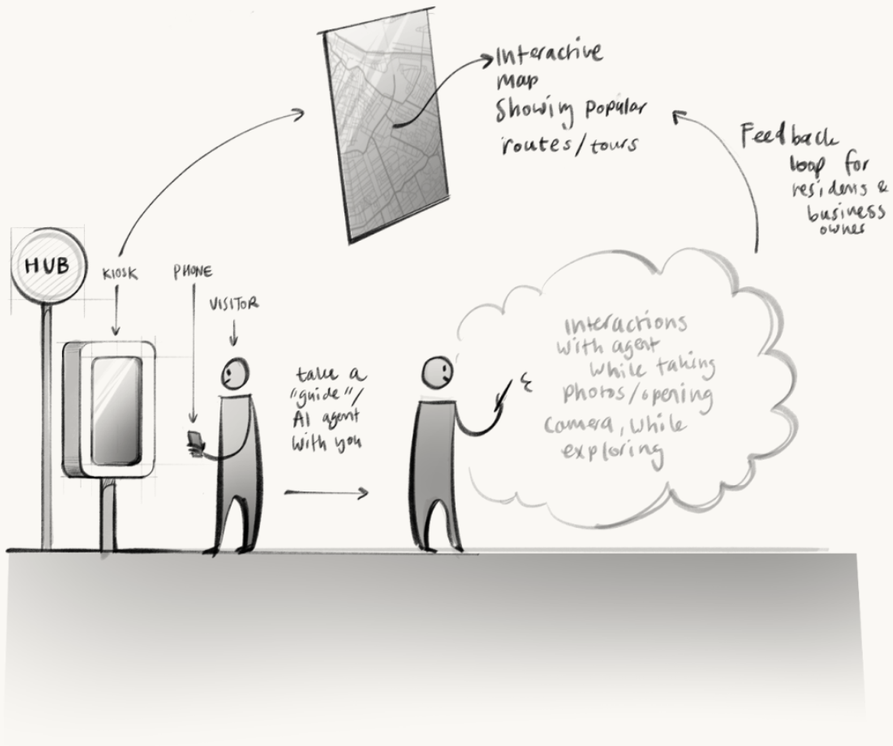


I chose this analogy because it captures the conclusions and themes of my research: The neighborhood (API owners) can set their own goals, parameters, and functionalities, while the visitors (Developers) can basically do whatever they want with the toolbox they've been provided. In this way whatever is being implemented in the neighborhood, is done through a bottom-up structure. It can only exist within the rule system that is provided by the neighborhood, whatever that entails. At the same time, an API provides a dynamically stable system: it evolves continuously but has backwards compatibility, meaning it supports changing needs, but these changes do not break the existing functionality.

Based on this analogy, I've conducted an ideation process that can be found in the appendix. We can see the resulting user flow below.

In this new flow, **visitors will gain access to a conversational agent** once they arrive in the neighborhood, which they would take with them and interact with while exploring Amsterdam, to navigate the city in a way that is less restricted. They do this while **interacting with the agent in the moment**. These interactions in turn provide data to community members, which might serve as a **feedback loop** for residents and business owners to better understand what visitors might be looking for or expecting.

One goal of this new flow is to shift the exploration process forward, opening up the restrictions visitors feel while navigating Amsterdam, during their visit.



4.3 Survey: Practical insights, leverage point

4.2.1 Results

25 people ended up responding to the survey. In terms of demography, most were under 35 years old, 13 (52%) of them being under 25. Half were Dutch, the other half were internationals.

Everyone consciously leaves at least some flexibility to their city trip, with no one stating they do a rigid planning. The most popular option shows some **exploratory research beforehand, leaving spontaneousness once they are already there**. Most (80%) use search engines like google, and 84% prefer getting a recommendation from friends or family. Most also use social media and map/navigation software like google maps.

Some notable comments from the open-ended question are shown below.

In general, there seems to be some variation in strategy, tools, and attitude toward planning.

However, most look for the most popular destinations at first, either through search engines or social media, mainly Instagram. These searching strategies range from the most generic prompts ('top things to do in [city name]') to more pointed searches, looking for museums, specific shops, etc. A few participants specifically describe switching to Google Maps once they arrive at the location. Two participants mention liking Reddit as a source as it provides a way to get more genuine recommendations, instead of curated ones.

Most participants state they either didn't change their planning/navigation strategy in Amsterdam, or that they were familiar with the city in some way, either through friends or family, or having visited before. In that case, they rely more on recommendations, or don't do any planning beforehand.

> *" I collect reels I see on **Instagram**, then go through them once I've arrived there to see what I wanna do. (..)"*
>
> 26-35 y/o Dutch student

> *"I start with general search like "things to do in Florence" (...) Then at some point, you find specific terms liks "agriturismo." (...) **I like tips from real people** so I enjoy results from reddit, google map reviews, or search in that language."*
>
> 26-35 y/o South Korean designer

> *"[I Google] Things to do in (...), **Top 10 things to do**."*
>
> 18-25 y/o Dutch person (unemployed)

> *"**Google maps** [is] by far my favorite method to explore, especially **spontaneously**. For food places I filter on 'Open now' and High Rating (my brother and I found that at least 4,3 stars are usually solid food places)."*
>
> 18-25 y/o Dutch student

> *"It also depends on how popular the destination is and how close it is to my own culture.(...) **I think the closer the culture is to my own, the less I want/feel the need to plan**. "*
>
> 18-25 y/o International student

It seems more than half of respondents relied at least somewhat on map services while navigating Amsterdam, but also on their own senses while exploring the city. When diving a bit deeper through the open-ended question, we can explore what went into that process. Most share practical considerations such as price and weather, but also the distance to their current location, it being more of an in-the-moment decision. 6 respondents pay attention to ratings and reviews through Google Maps or Yelp. The two Chinese respondents both mentioned using Xiaohongshu or Little Red Book, which, after speaking with a frequent user of the app, is hard to compare to any app Dutch people use, but is similar in the way that keywords are used to find popular places to visit, and reviews can be found.

8 share some in-depth scenarios stating that it was highly specific to their situation, with 3 others saying it depended on their travel companion's interests or opinions. Most refer to some kind of intangible attributes, like vibes, ambiance, liking how it looks, et cetera. Crowdedness and authenticity were also mentioned by 4 and 2 participants, respectively.

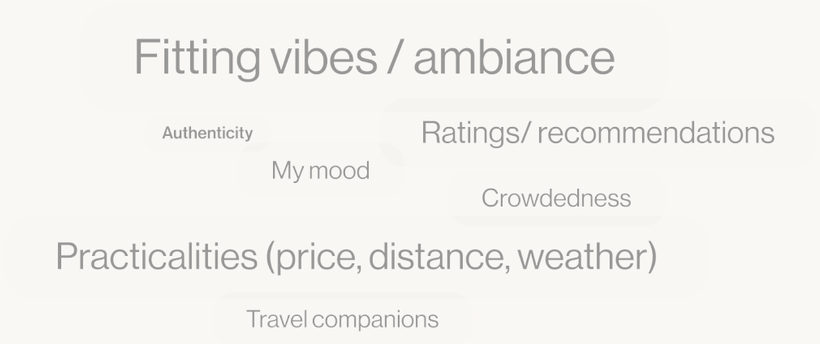
What stands out immediately is how similar people's strategies are, and how most respondents seem to have some sort of action plan involving filtering criteria which are available on navigation/social apps. One respondent reflects positively on their strategy, finding it trustworthy, but regrets having a blind spot for 'current events'.

"I like my process of finding things, I think it's quite trustworthy and I'm used to it so I can do it pretty fast. However, I do think it's a pity I'm missing out on current events maybe." - Turkish/Dutch Student

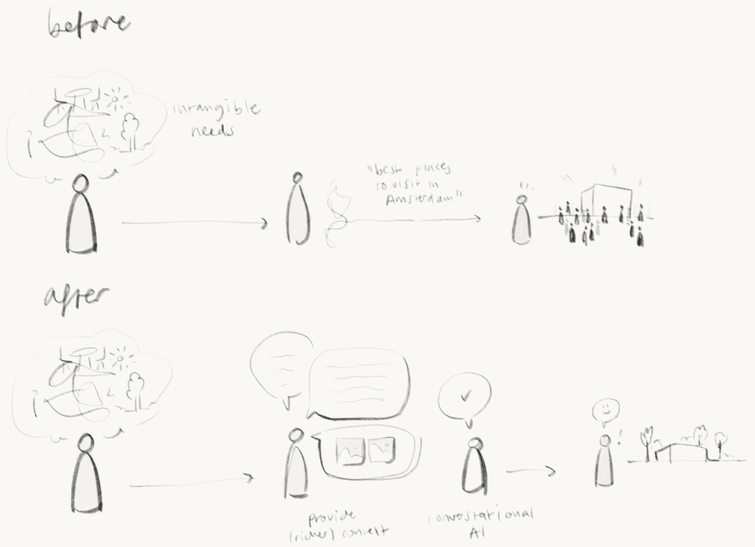
Another respondent has more difficulty with their navigation strategy, even commenting on how it affects their impression of Amsterdam.

"(...) I always struggle to find a good restaurant in Amsterdam [through a search engine], and it makes the whole impression of the city less attractive, as we would end up walking a lot to find reasonable value money and cosy [sic] place to eat" - Ukrainian facilitator, teacher

Please share what makes you pick a certain place, like a restaurant, café or museum. What factors go into your decision? (N=23)



4.2.2 Conclusion



Participant's strategy on their visit to Amsterdam varies based on the context of their visit, but mostly their expectations towards visiting new cities overall.

However, most people, even those who want spontaneity during their visit often did research beforehand, so they had options when the moment came, once they were in Amsterdam. People describe how they've developed their own research processes through experience, and some even express pride in them, trusting their own methods.

A promising leverage point to me seems that a lot of the decision making process seems to be 'vibes based' (for lack of a better term). Most participants mention that elements like the ambiance or their mood strongly influence their decisions. These are quite intangible needs which are hard to describe, let alone type into a search engine. It might also explain why many develop an elaborate navigation strategy.

Again, this would fit the 'bottom-up' role, directly gaining context rich insights from the visitors themselves through intuitive exchange. How those exchanges would look like, will be explored in the next section.

4.4 Scenario sessions

What kind of interactions would prompt a visitor to engage and interact with an agent they take with them through the city? What kind of details would they share, and why? To what extent are they willing to delegate the exploration to the agent?

These are the main research questions I had when conducting the sessions, which afterward I made up scenarios which would serve as a familiar setting for participants. Again, this process was non-linear, but more structured than the ideation process.

4.4.1 Results: interactions and opportunities

In general, visitors prefer to share only the data that they have consciously shared through conversation. When they were steered somewhere based on information that the agent knew but they hadn't willingly given out yet, they became uneasy and rejected the service. However, they are generally open to being guided, provided the direction aligns with their deliberate choices.

They often seek information that is difficult or impossible to find beforehand, such as local and very situational events. Anything that makes the city initially less intimidating is also appreciated, meaning they trust and understand the city logistics.

Their interactions with conversational agents tend to vary depending on the situation, engaging primarily when they are actively looking for something specific, such as a restaurant or a place to sit. In this scenario, visitors were willing to explain and provide detailed input, even while walking through the city.

The idea of taking photos is appealing as it could help train the agent on their preferences, allowing for personalized nudges through vibrations or notifications. Moreover, the exploration process itself is an integral part of the tourist experience and should be respected. But avoiding crowded areas then overrides that.

I've wrapped up these insights, along with specific scenarios that were mentioned by participants, in 3 'scenarios'. These also show the other side of the system, how for example business owners or residents can interact with the system that benefits them.

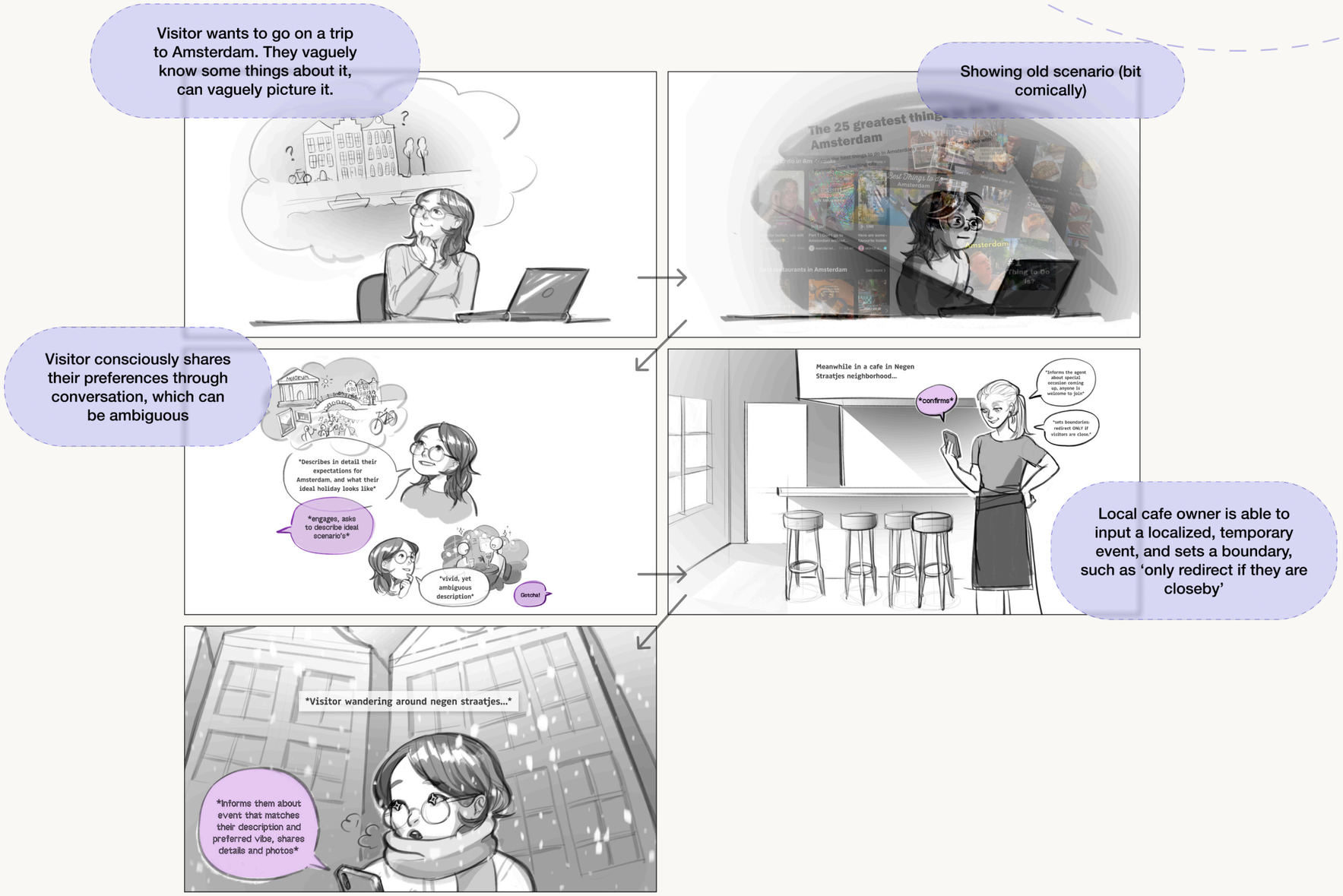
Scenario 1: The visitor and the navigator

In a change from the initial flow shown in 4.2, the first scenario shows how a visitor will initiate interacting with the navigation service agent before their visit. There, they can prime the agent at their own pace after which it will provide them with personalised suggestions on where to go to. In this scenario, they share that they ideally like to meet new people when going on vacation. When asked to elaborate on what they mean, they share that they like to meet people at a bar, for example watching sports or doing a game night. Since this is an ideal situation for them, they give permission to be nudged or notified by the agent in the city, when anything pops up.

Then, we are introduced to the other side of the system, where a local cafe owner accesses the community platform to let the agent know that they are hosting a Wimbledon watch party later. Anyone is welcome to join, but they don't want it to be too busy. They ask to only redirect people if they happen to be close by that night.

Lo en behold, our visitor happens to be at the right place at the right time. The agent, knowing their preference, suggests to check out the bar!

This scenario shows a few things: A way for the visitor to take control over how they want to experience the city, and on the other side the local business owner who can appropriately change the visitors flow.

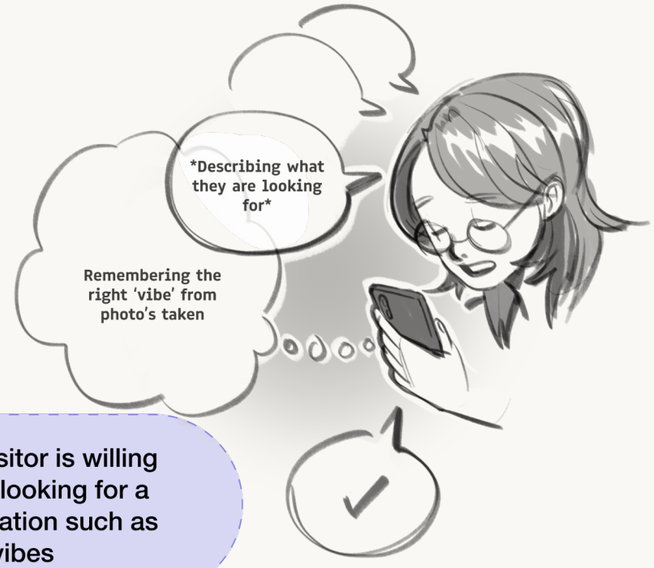


Scenario 1.5: The vibe check

This short scenario shows the visitor taking photos like they always would, then, the visitor needs something from the agent in the moment, and is engaged and willing to share preferences. The visitor is looking for a place to sit and have a drink, and again have **intangible needs** that they are expressing through conversation.

This time, the agent uses the taken photos to **cross reference** existing photos of nearby cafes, after which it can make suggestions based on the general atmosphere the visitor seems to like. The visitor, knowing this beforehand, has been deliberately taking photos of places she thinks are pretty, to train the agent.

This scenario mainly shows the potential collaborative nature of the interactions.



Training agent by taking photo's in the moment

Showing a moment where the visitor is willing to most engage with the agent: looking for a hard to describe, ambiguous location such as a cafe with the perfect vibes

Scenario 2: Neighbourly intervention

The next scenario shows a familiar view: A new fry shop opens up, and thus more visitors that enjoy their snacks on the street. The municipality only cleans out the trash bins two times a day, and when a new hotspot appears, it can't deal with the overflow. Naturally, a trash bin close by starts piling up garbage every day. A resident notices this, and immediately decides to investigate.

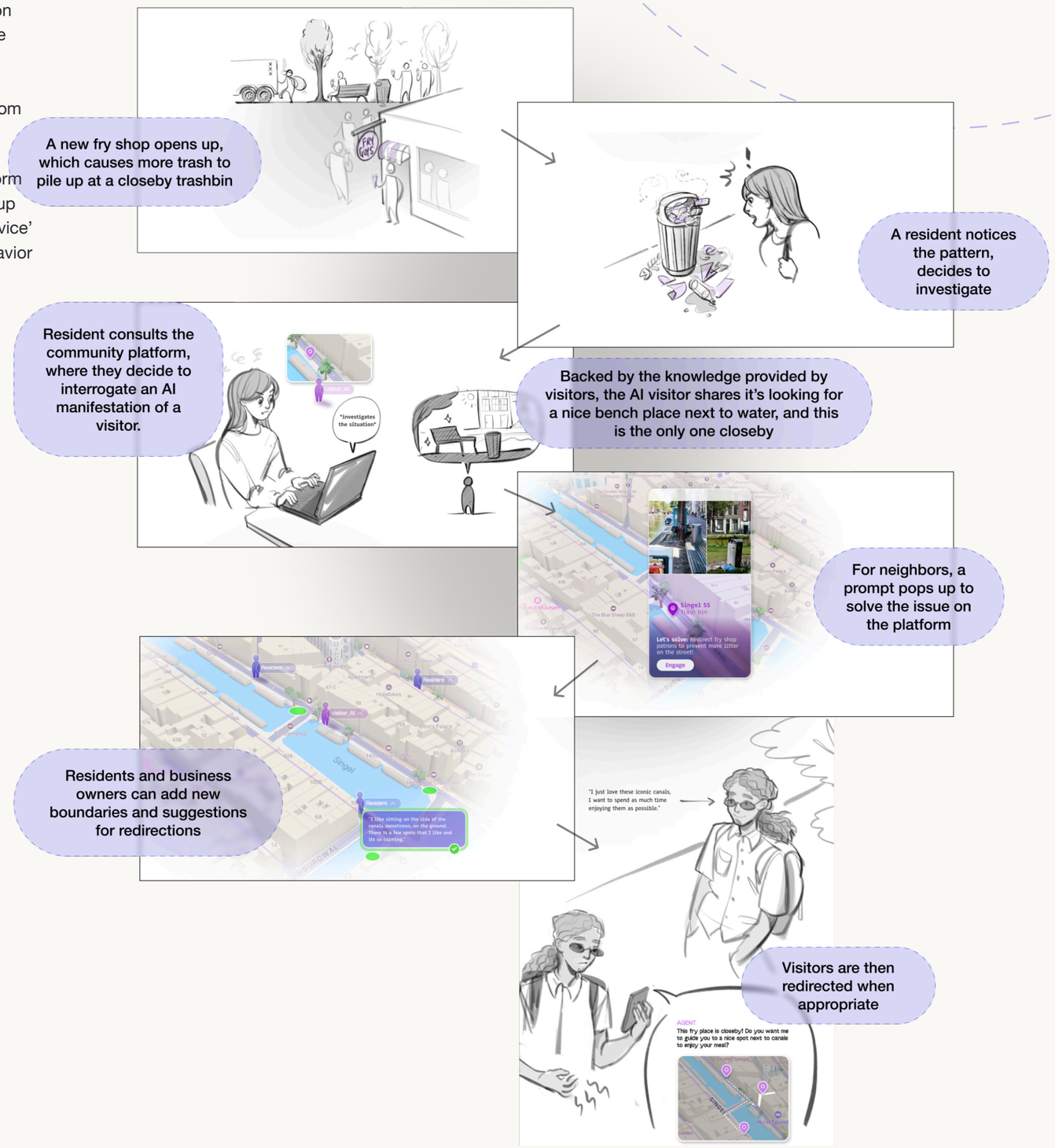
They consult the community platform to investigate. They ask the AI visitor to explain their behavior. This AI visitor is essentially a fake visitor, that the AI system can mimic based on all the information it has gathered from real visitors while interacting with them through the navigation service. Through that, it knows that most visitors from outside Amsterdam prefer to find a spot next to the canals to sit, as it's a novelty to them. When prompted with the question to explain themselves, the AI visitor happily explains to the resident that the trash bin they pinpointed on the map is right next to the perfect spot to sit. Having it flagged as an issue, the agent on the platform suggests to think of ways to solve this issue through redirecting fry shop patrons.

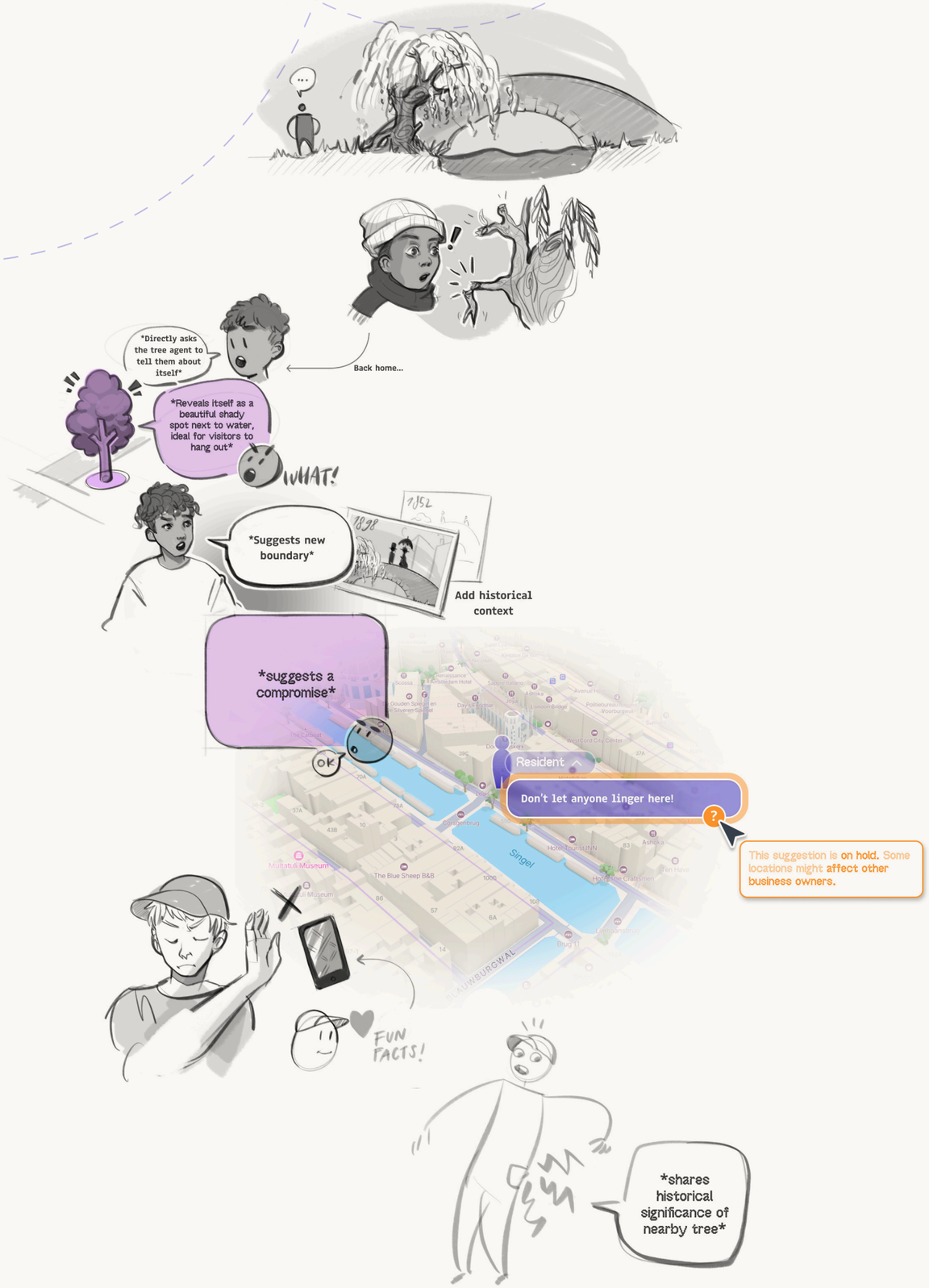
Neighbours, meaning residents and business owners in the vicinity of the selected trash bin, get prompted with this message to think along. This happens on a transparent platform, meaning all suggestions can be found and, if a new boundary or suggestion is accepted, this will be visible too. Here, a resident suggests other spots for visitors to sit, based on their own personal experience. Anyone can see that the agent has accepted this suggestion and will use it to redirect visitors.

Lastly, we see that visitors can be redirected when appropriate, meaning in this case the visitor has explicitly stated they would like to be.

This scenario introduces community decision making and 'mobility orchestration' from the bottom up. Visitors experience changes or issues that they want to change, then are informed by rich data that comes directly from an involved stakeholder, meaning a visitor.

The scenario shows one way how the platform could be a space to collaborate and come up with new boundaries for the 'navigation service' agent, effectively changing the agent's behavior and thus changing mobility flow.





Scenario 3:

The last scenario shows another concerned resident taking note of their neighborhood- the old tree seems to keep being disturbed. The branches are broken.

When they take to the platform, again, they investigate the situation. They ask the tree to tell them about themselves, after which it tells the resident they are a beautiful tree with foliage, providing perfect shade and is a good spot for hanging out with friends.

This shocks the resident, as the tree, which is one of the oldest in Amsterdam, is actually very delicate and should be left alone. If the AI system thinks its a hangout spot, it might mean that it would direct visitors to go there for that reason. The resident provides this **historical context**, even saying a famous Amsterdam writer wrote about the tree a 100 years ago.

They ask the AI to stop making people linger there. However, this **suggestion is put on hold**, because businesses around it might be affected. The suggestion appears on the platform for other community members, which they can respond to or make other suggestions.

Next, the scenario shows a visitor who has engaged with the agent to figure out their goals and share preferences, but decides **not to engage** with their phone while exploring Amsterdam. However, he gave one exception. Since he loves nature and fun facts, the agent is **allowed to bother** him if he happens to be close to a location he might want to learn something fun about. The agent, having learned the historical anecdote from the resident, promptly decides to share it with the visitor when he is close by (with a little warning about its vulnerability, of course).

Not only does this scenario show how visitors can have more **desirable behaviour towards the public space** through the navigation agent, it also shows how it can reinforce aspects of the **neighborhood's identity** through the knowledge shared by the residents.

At the same time, it shows how the platform might deal with a **clash of needs**: the resident wants no one to linger near the tree, but nearby businesses might be affected by them. The agent can suggest a compromise and propose it on the platform, where the business owners can look for the rich context themselves to understand the situation and respond.

4.4 Conceptual model

The image on the right shows the conceptual model of the AI system I'm proposing.

On the bottom, showing the real-world context of Amsterdam and the Negen Straatjes, with some of the dynamic aspects which were discussed. Above that, there is a stack, which represents the AI model.

The layers from the bottom-up: (ha ha)

Captured context Layer
Basically, this is all the sources the system can tap their data from. In our context, this would be API's that capture location, business, real time traffic information such as Places or Traffic API (Google), as well as anonymised crowd monitoring, Open Data from the municipality of Amsterdam. This is needed to access mobility data and geographical information, as well as laws and policy. Also, local public transport API to access public transport related data such as arrival times, delays, et cetera.

Data (input) Layer
In this layer, relevant aw data is collected and fed into the system.

Pre-processing Layer
Here, data is cleaned, transformed, and structured. This is essential for models to produce reliable outputs

AI models Layer
In this layer exists the AI models needed to make the two platforms run. For example, a Natural Language Processing (NLP) model in order for the conversational agent to talk.

Integration and Decision making layer
This layer is where data fusion, contextual analysis, and decision making takes place. It connects the AI system with the two touchpoints of the platform and navigation service, both of which in turn keep feeding into the system. This layer kind of creates a holistic overview of the city.

Navigation service
Visitors make use of the AI system through the navigation service, accessing data on business hours, traffic, locations, etc. While doing that, they interact with the conversational agent, which again gets data from the visitors which gets fed back into the system. The navigation agent's behaviour is ever changing, depending on real time data from the city, as well as boundaries set by the community platform.

Community platform
This is a platform for residents and local business owners to gain insights into what happens in the city, and set boundaries for the navigation agent.

4.5 Validation

Overall, the aim of this intervention is to offer an alternative to what role an intelligent layer can play for the 9S neighborhood in Amsterdam. It was the result of a mostly exploratory research process, where a lot of themes were discussed until a final scope was chosen to further develop. This is why its a bit challenging to exactly validate the output, however, there were clear recurring themes throughout the explorations, which were used to pinpoint the exact themes for discussion.

First off, the intervention should be very relevant to the neighborhood and Amsterdam in extension. What that means exactly, I have defined for myself in this project. The most important aspect is that the system should give the local community more autonomy through a bottom-up structure, as this is in line with the local culture and existing behaviour patterns I saw. If we zoom out, it should be able to capture changing needs and support a dynamically stable system that way. However, the latter is hard to prove with just a conceptual model.

Thats why, to be able to have some critical reflection on the output, I decided to set up an interview with an expert on Contestable AI to discuss the themes of autonomy, democracy and further relevance of the system.

4.5.1 Method

The interview was conducted through an online call. I briefly explained the purpose of my output, then showed the conceptual model. Then, I went through the scenario's one by one. I prepared pointed questions beforehand, but kept it unrestricted as I trusted the discussion would come up naturally.

4.5.1 Reflections on the output

The interviewee had a lot of reflections to share on the scenario's and its impact on a more democratic way of steering visitors. They state that this has essentially never been democratic, and due to the direct intervention of residents through the platform, this would be the case. However, they had a comment about scenario 2, that the responsibility of the trash problem should be on the fry shop owners. The business owners should take more responsibility, as they attract the visitors that then leave their trash. After asking if that would mean that there should be different roles designated based on being a resident vs business owner, they agreed. Introducing different roles If business owners don't comply, they could even be taken off the platform.

On the subject of autonomy, they had a few pointers to share. What makes you make a decision autonomously? If the visitor shares the suggestions they want to receive and proceeds with the suggested outputs, it is not really an autonomous decision yet. What would make a difference is for the agent to be transparent about why a certain suggestion is being shared. This way, the visitor can still make a conscious and informed decision when they receive it. This makes a lot of sense, especially since I'm now essentially trading one algorithm for another, the decision making behaviour stays the same.

The map platform to set boundaries was interesting as well. In scenario 2, visitors can suggest places to sit. However, they pointed that it could also be interesting for property owners to open up private spaces, for example during specific times. I then recalled a sign I

Figure: sign stating that a public park has been 'opened up', which has, perhaps a bit ironically, been placed on a large planter with a bench attached to it. The sign urges for certain social rules.

saw during my observations in the neighborhood, which essentially shows the same behavour, and would probably fit the neighborhoods community values.

I think that having community members 'play' by different rules and giving them more responsibility, like the interviewee suggested, would be one clear way of prioritising resident needs over business owners, which I agree with, but am not entirely sure anymore why I was reluctant to ever prioritize them. Again, who owns the public space, everyone does, but in case of cleaning out garbage, everyone profits. It's a case of collective benefit.

If we look back at the stakeholder map, we can also agree that business owners, as having the most impact but most interest in the mobility flow of the neighborhood, should then also probably take the most 'responsibility'. This is another dimension that would be interesting to further develop into the platform.

5. Conclusion

This thesis started as a search for an intelligent layer in a mobility hub but soon transformed into a broader exploration of resilient mobility infrastructure. I zeroed in on the Negen Straatjes neighborhood, with its dynamic and clashing needs, and quickly found myself immersed in a maze of deep dives and unexpected twists. This project includes some sideway explorations that might seem aimless (and, frankly, they were), but in the end, these misadventures gave me a more nuanced understanding of the space, even if the result is a bit of a confusing read.

Diving into the neighborhood, I realized how deeply public space and mobility affect community identity, with visitor behaviors making everything messier. Through mapping stakeholders, I discovered that not everyone's voice should necessarily carry the same weight in shaping mobility flows. At the same time, the current top-down municipality strategies seemed out of touch. This disconnect got me thinking: What if we flipped the approach and started from the bottom up?

From there, I can hardly explain how the ideation process unfolded—it's as messy as it reads—but I tried to capture what I envisioned: a system where residents notice issues and propose changes through a community platform, making mobility management democratic and driven by those living in the space. Sure, it's not the most practical idea—good luck getting navigation services on board to share data for less usage—but that's not the point. It's an exercise, maybe even a bit of a critique, pushing back on smart city concepts that overlook the messy, human-centered side of urban life. I am trying to offer a perspective that is a bit different from current smart city visions.

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7. Appendix

7A : Graduation project Brief

DESIGN FOR our future

TU Delft

Personal Project Brief – IDE Master Graduation Project

Name student Lisa Laverman **Student number** 4664329

PROJECT TITLE, INTRODUCTION, PROBLEM DEFINITION and ASSIGNMENT
Complete all fields, keep information clear, specific and concise

Project title Designing for dynamic stability in mobility hubs through community owned agents

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 context of the project is the Collect & Connect Mobility hub in the “nine streets” neighbourhood in Amsterdam. This hub is a concept set up by Cities of things foundation and Springtime design studio. This will be a neigbourhood hub, or wijkhub -as defined by Amsterdam municipality- that facilitates both logistics and personal mobility in the neighborhood. Currently, the project is at a conceptual stage and they want to further realize the digital ecosystem and its touchpoints, or digital layer, of the hub.

An important aspect of this digital layer is that it is intelligent -meaning artificial intelligence (AI) is involved- which could make the service more responsive, personalised, and anticipate user’s needs. The use space and resources can also be allocated in a flexible way. Here lies an opportunity in achieving dynamic stability- meaning the ability of a system to adapt to a (previous or new) steady-state after a significant disturbance (Kim et al., 2022).

The increasing use of AI in public spaces has sparked ongoing academic discourse to ensure its responsible implementation and degree of agency it should have, which is also why this project was set up: to ensure that developing the intelligent digital aspects and touchpoints of the mobility hub is done in a responsible manner and remains resilient through time.

Since this project is in its beginning stage, I will keep in close touch with how the project is developing through my clients, as they are also gathering input from stakeholders and potential partners. This is a limitation as the project might be dependant on their results, but they can also connect me with those same stakeholders for my project and I would get more insights in the meantime as well. To have an effective collaboration I will work in studio in Amsterdam 2 days a week.

➔ *space available for images / figures on next page*

introduction (continued): space for images

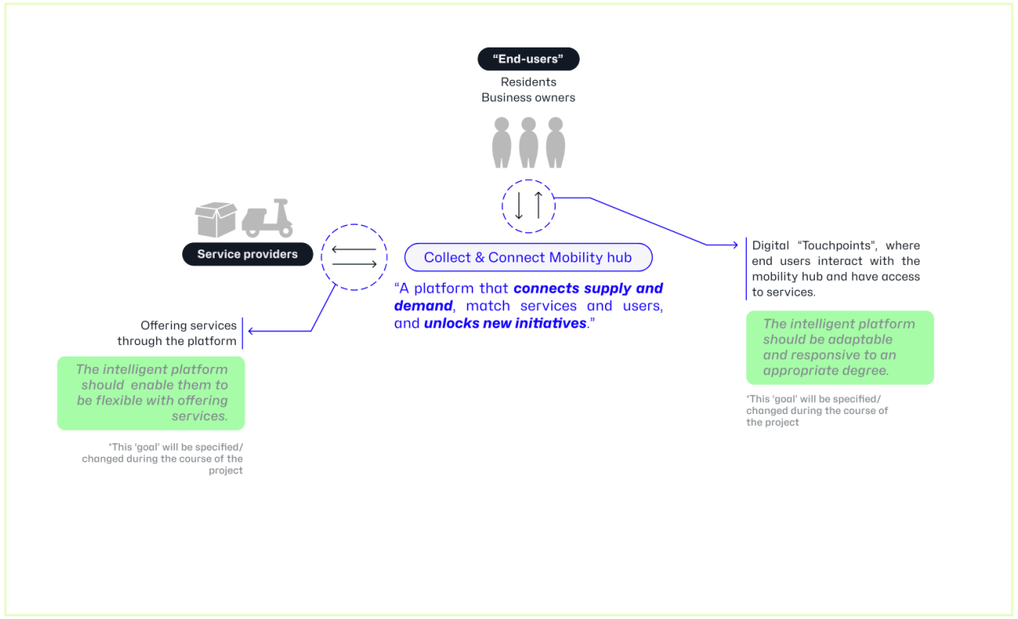


image / figure 1 Current design scope, to be updated

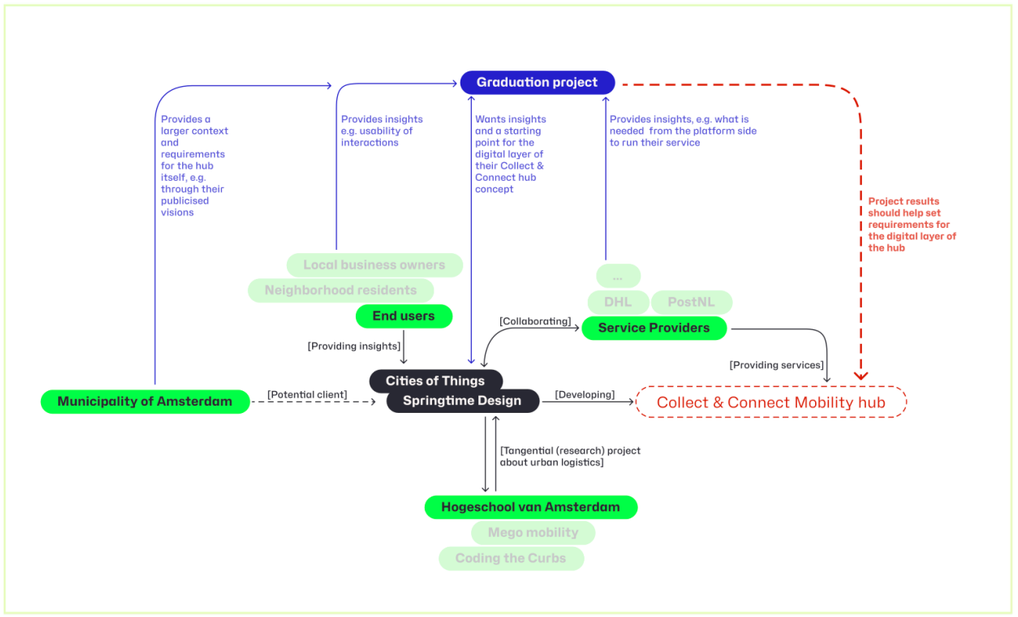


image / figure 2 Current stakeholder overview and positioning of graduation project

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)

First, the context needs to be understood: What are the current plans for the Collect & Connect Mobility hub and what are the stakeholders and end users? What are their expectations, needs, and wants? What are the design implications for those? These are the practical considerations to realize the design. At the same time, there are two more abstract themes to explore: How can community owned agents foster dynamic stability? What is the appropriate role of the Agent in the interactions with its users?

The correct design scope should be established. This will be done through defining specific use cases as well as specific design goals for each of the layers of the aforementioned stack, as well as defining which layers the design should focus on.
Once the concrete requirements are set, an appropriate role for the AI in this interacion needs to be explored. Not only its practical functions but also its degree of autonomy and responsiveness in the interaction.

Since there is a mixed digital literacy among the stakeholders, this interaction, and in extention the hub's services, should be easy to understand and accessible for everyone.

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:

Explore and design intelligent touchpoints and human-agent interactions for the Collect&Connect community hub to facilitate logistics and personal mobility for residents and businesses in Amsterdam's Nine Streets neighborhood, achieving dynamic stability over time.

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)

I will use a Research through design (RtD) approach to understand the context and explore and design the role of AI in the concept. I will define RtD as: "Learning through designing, observing and reflecting on the response to design artifacts" meaning I will use design expressions such as prototypes, sketches, mockups in sessions with stakeholders to gain insights.

The goal is to have multiple cycles where iterations are made to answer research questions I've set during the earlier stage. In total, I plan to have 3 cycles: Finding the design scop/goal by learning from the context, Exploring different interventions (based on design scope), and defining the concept in the third cycle.

From the outcomes, I will create a customer journey and a design. I have agreed with the clients to have a design which is 'universally applicable', meaning in all of Amsterdam, but use the negen straatjes neigborhood to make a proof of concept.

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	8 Dec '23
Mid-term evaluation	2 Feb '24
Green light meeting	t.b.d
Graduation ceremony	t.b.d

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

Comments:

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)

I have been interested in the intersection of design, technology, and public space for some time, which started during my minor in mobility design, when I was tasked to envision a future mobility system and was confronted by how I believe interactions for public spaces should be inclusive and create opportunities for citizens to participate in public life. I am also intrigued by the potential of responsible AI, which I have explored during my internship last semester. I hope to contribute to AI solutions that are fair, unbiased, and beneficial to society.

This graduation project allows me to combine my interests in mobility, public spaces, and AI. Also, I am excited about the opportunity to apply my skills to a real case and gain more experience in practice. I hope to gain valuable experience through this project that will help me to advance and further define my career goals as well.

7B : Session / interview test plan

Research Setup [document frozen before pilot 23/01]

General research question:
How can Artificial Intelligence (AI) be leveraged to establish a mobility hub that is responsive to stakeholder needs and ensures the appropriate agency in facilitating a feedback loop?

- How can AI be used to gain a better understanding of how relevant a mobility hub is for its community?
- What are the "dynamic" elements in stakeholder needs?

Who?: Lony Scharenborg is the 'neighborhood manager' and representative of the negen straatjes neighborhood. In her own words (LinkedIn), she advises local businesses and is involved in setting up pilots in the neighborhood, community building, and development. According to the project clients, Lony is a very analytical and practical minded person, and it is important to frame the session and questioning in a way that doesn't distract her from the practicalities of the hub, as it's still at a conceptual stage.

What?: This will be an interview followed by an interactive session with a design artifact, to investigate how Lony envisions the mobility hub to be situated in the neighborhood. Both in a practical sense, meaning who will use it in what way, but also in what role the intelligence should play in the community*. In general, the aim of this test is to gather insight into what the ideal positioning would be for the hub in this neighborhood.

Where?: This session will be held in a cafe at negen straatjes neighborhood. About 90 minutes long.

Research questions to be answered during the session

- Who will be the stakeholders involved with this hub?
- In general, how will the hub be used?
- When might the hub become less relevant for its users?
- What kind of role for AI might be best keep 'up to date' about resident's needs?

Interview/Session Setup

Introduction:
The participant has basic understanding of the mobility hub concept already, and has worked

with the clients before. However, she does not know anything about the intelligent layer. I will start with asking her what she knows already and filling in any gaps of knowledge.

Profile/ introductory questions:

- What do you do? (Who do you work with?)
- What do you know about this project already?
- How would you define a mobility hub?

Interview questions/ co-creating a stakeholder map:

→ This will be done while mapping out all stakeholders. The questions are to guide the mapping.

- What benefits do you anticipate for a hub like this? (why?)
- Do you anticipate disadvantages?

"I want to use this session to understand who might be involved with the mobility hub. So who will use it, who will be service providers, anyone else that might be involved, what are their needs and interests?"

→ Start with mapping out what we already know, use a partially filled-in map? Maybe drawing out one or two scenarios. Can we think of more scenarios?

- Who else might interact with the hub?
- Who will benefit from this hub? (How will they use it?)
- Who will like this hub? (Why?)
- Who might not want to use this hub? (Why?)

Session:

"Let's say we are 5 years into the future. The hub has been implemented. We want to develop a system to have a good understanding of what everyone thinks of the hub, and what we could improve, at all times. Better said, it needs to always adapt to stakeholder needs. To do that, we need to anticipate how much their needs will change.

- Do you have some initial thoughts about this?
- How do you think needs might change over time?

→ Do a quick mapping of stakeholders based on how dynamic their needs might be - why? (The goal of this is partly to do a little sensitizing to the idea of dynamic needs, so its easier to think of a system that can respond to it)

We are exploring a few scenario's and we would like to know what you think of it.

I will show a few scenarios now. And I would like you to react to them one by one.

- Are there any first thoughts that pop up in your mind?
- Who do you think should experience this/interact with this? (why?)
- Who will benefit?
- Is there a better place/time for this interaction?

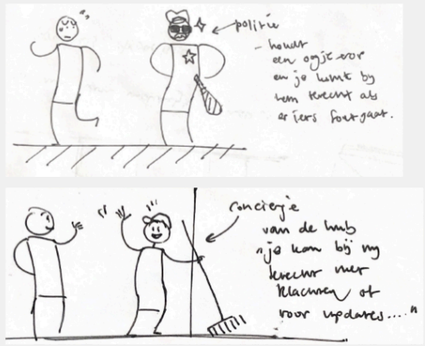
→ show simplified scenario:

Documentation and data analysis:

The session will require a lot of talking and possibly drawing, which is why I only want to take little notes of things that I think are very relevant in the moment. I will ask the interviewee if I can record our conversation, which will be transcribed. Then I will do a content analysis and possibly coding all the comments.

*Explanation of the 'role of intelligence in the community':
The mobility hub concept set up by the clients will have an intelligence that will also express itself in a certain way towards the community, and the aim is to understand what an appropriate role/expression would be for the AI. AI can behave and express itself like a human, and I should find the right set of expressions and behaviors to facilitate the feedback loop of the hub's relevancy to the community.

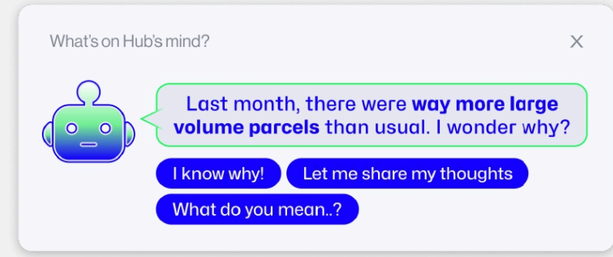
Comparing AI to a persona helps simplify its behavior, making communication and testing more straightforward. An example below:

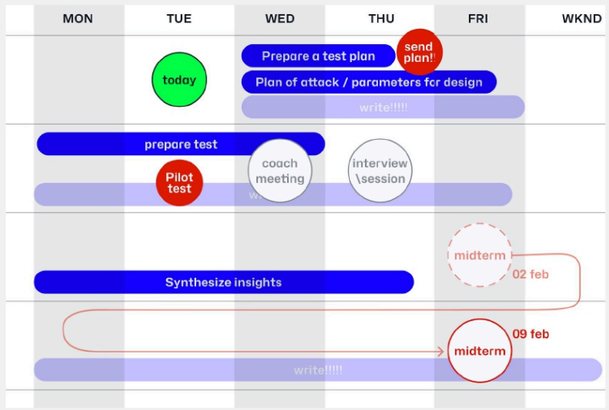


Description (in Dutch): *Police (left) Keeps an eye on things, and you can go to them if something goes wrong. Janitor of the hub (right) you can come to him for complaints, updates...*

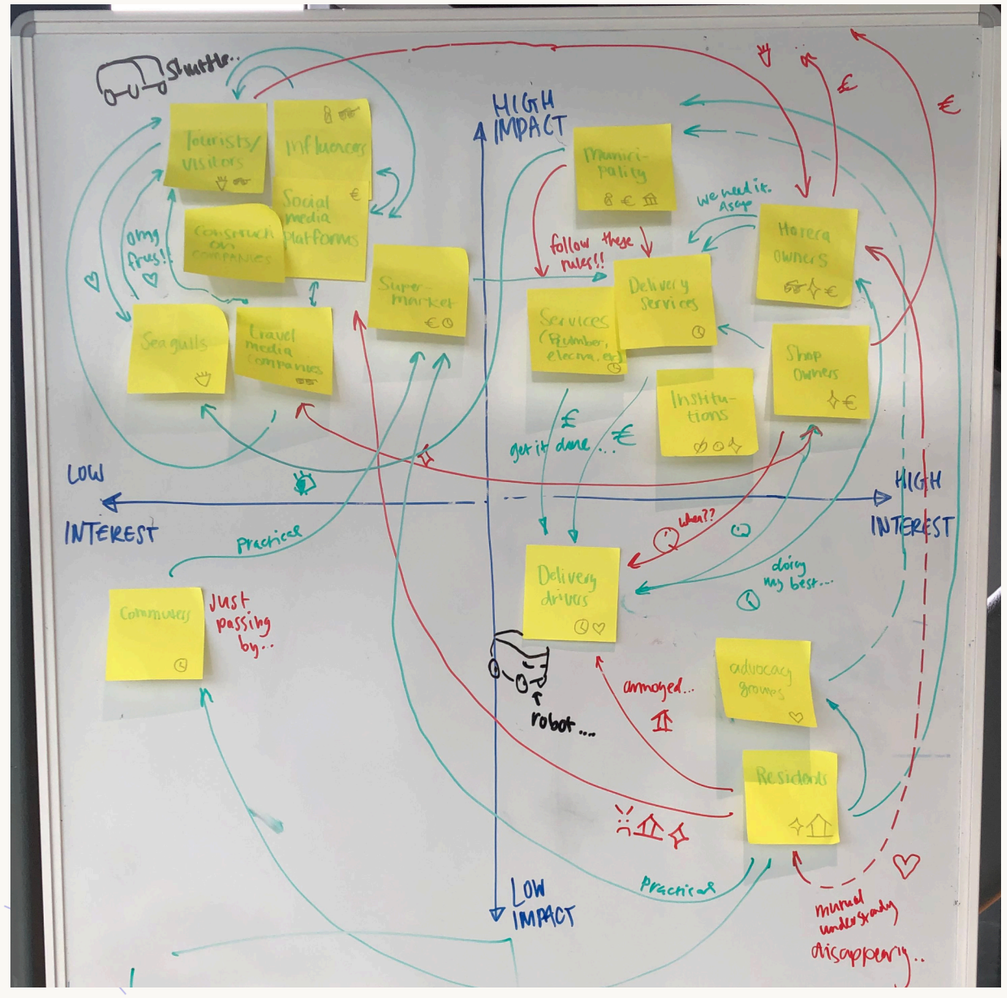
For example: During a session, I show a participant two personas: the janitor and the police officer. When asked who would do a better job, they choose the police officer. While discussing why they think that way, it becomes clear that they think someone with a degree of authority should be there, that keeps an eye on how people do and how they use the hub. Why? because they don't want to bother themselves and put much effort into giving feedback themselves.

An other idea is to show a few things similar to what I showed during the last coach session, and have her react to something more concrete. My gut tells me this will get clearer results that are easier to translate towards a final design. However, it will be unclear what the appropriate 'role' of AI will be, which is more useful for my research.

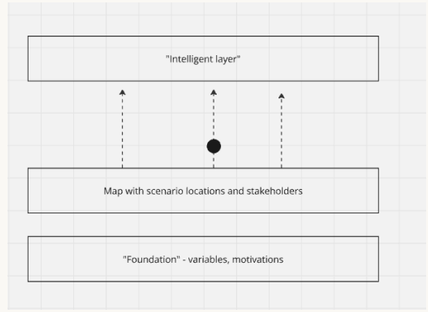


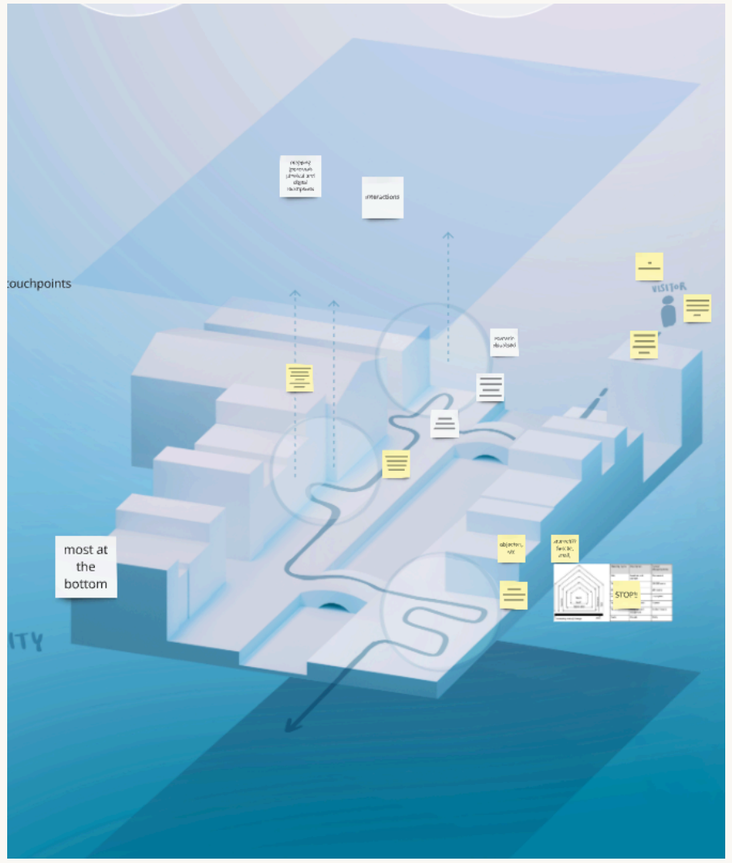


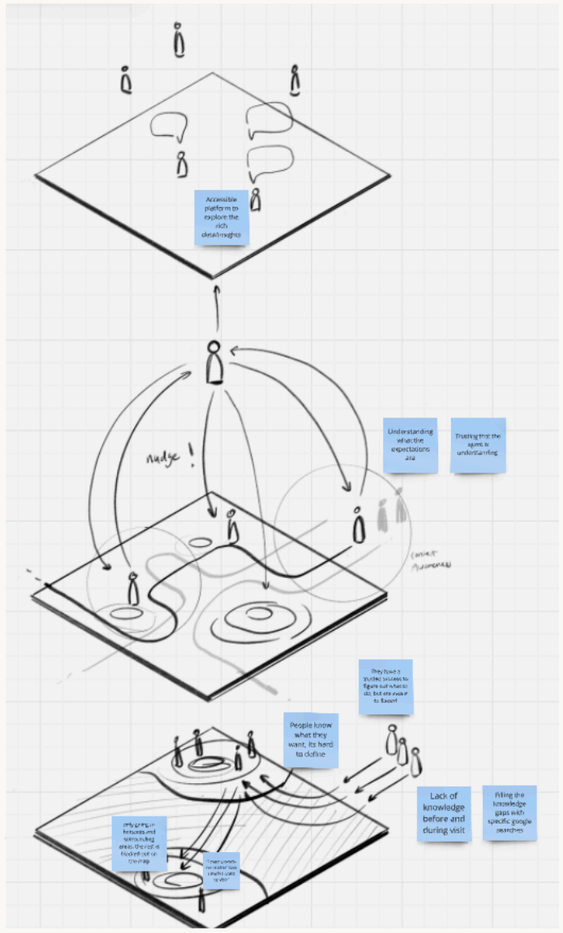
7C : Stakeholder map

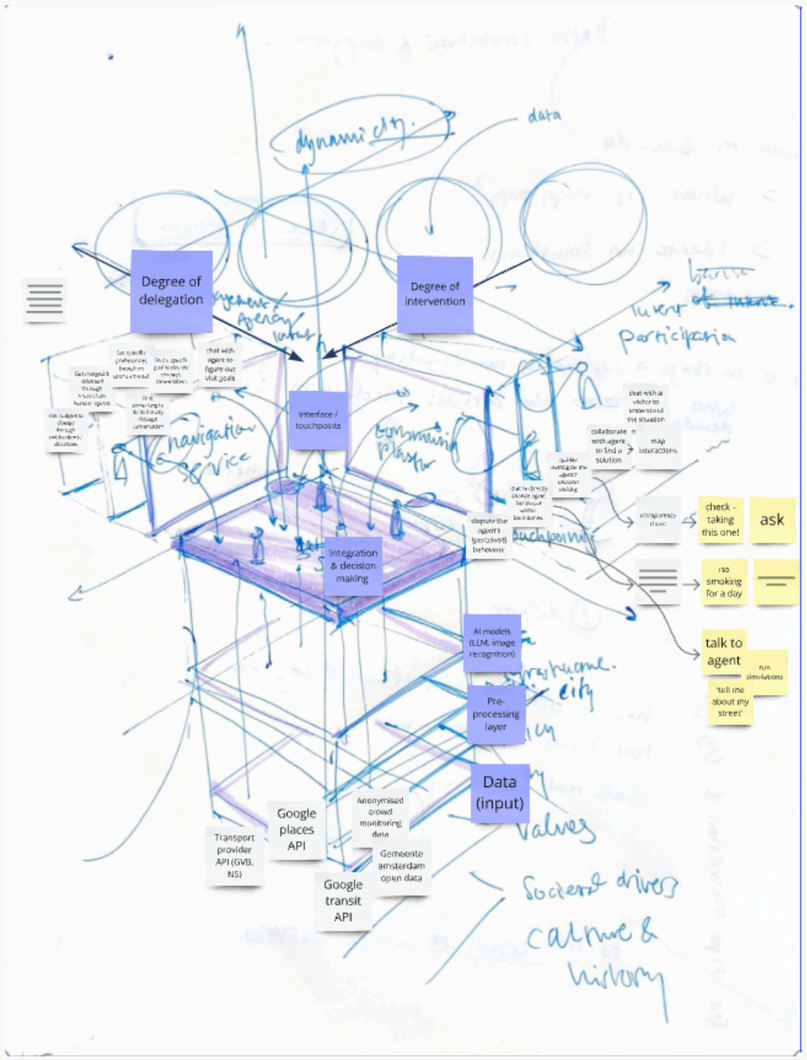


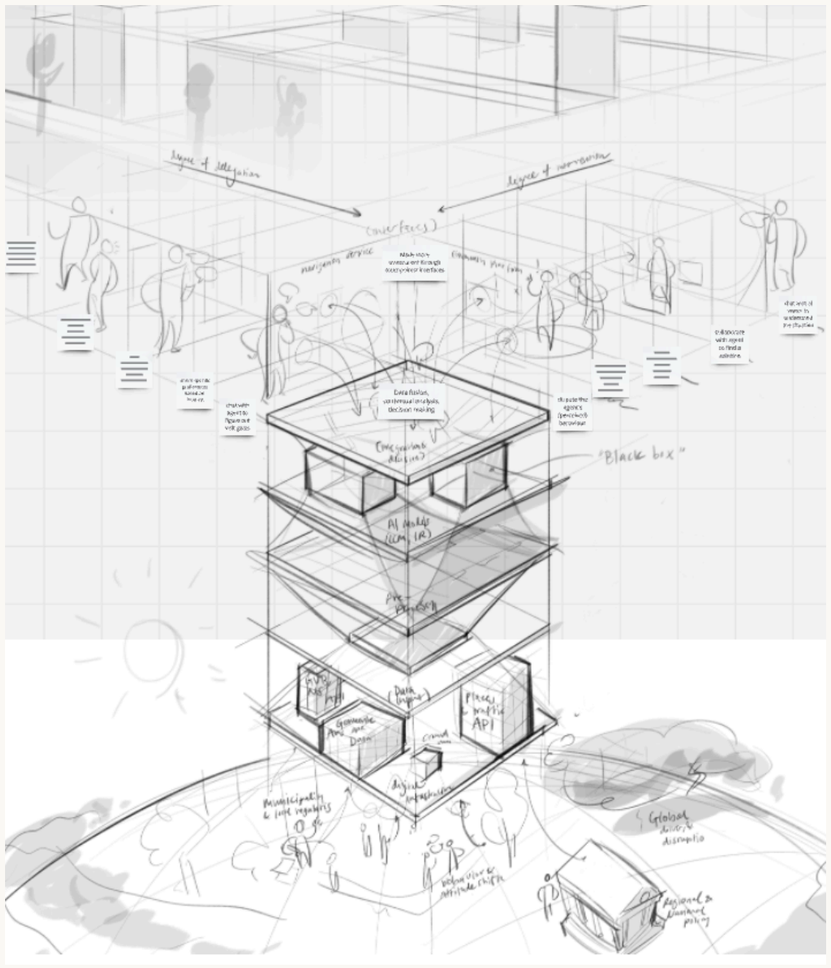
7D : Conceptual model process






Accessible platform to explore the rich data insights
nudge !
Understanding what the expectations are
Putting the agent in understanding
People know what they want, its hard to define
Lack of knowledge before and during visit


dynamicity
data
Degree of delegation
Degree of intervention
interface / touchpoints
navigation service
integration & decision making
AI models (LLM, image recognition)
Pre-processing layer
Data (input)
Google places API
Google transit API
Transport provider API (GVB, NS)
Gemeente amsterdam open data
values
Socieal drives
culture & history
check - taking this one!
ask
no smoking for a day
talk to agent
tell me about my street


"Black box"
AI models (LLM, CV)
Data (input)
Physical & digital API