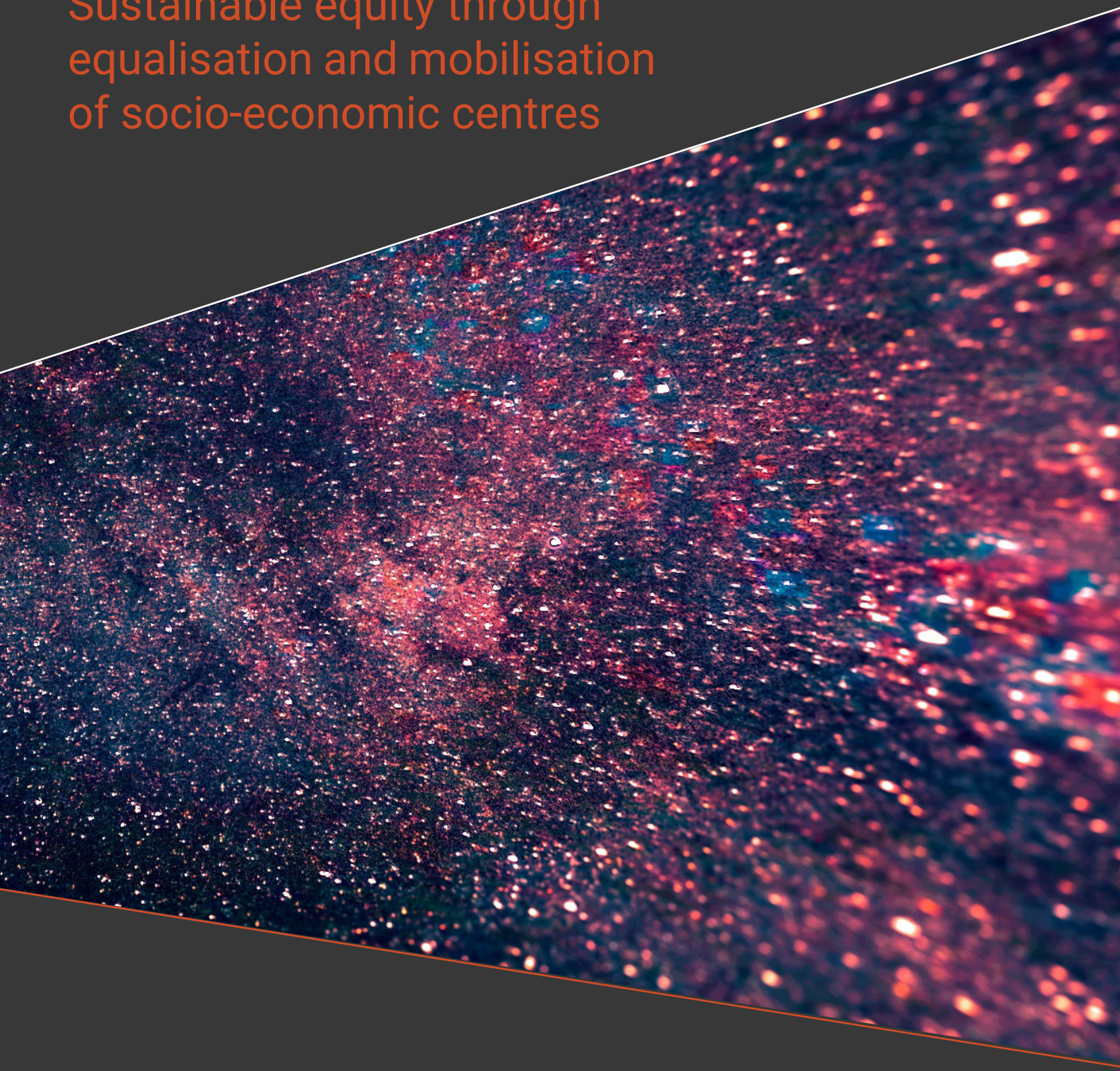
Future of Mobility

Sustainable equity through equalisation and mobilisation of socio-economic centres



An Integrated Product Design Master thesis by **Donovan Lewis**

0.0 Colophon

Future of Mobility

Sustainable equity through equalisation and mobilisation of socio-economic centres

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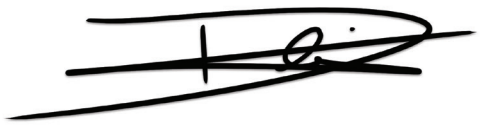
0.1 Foreword

The document you are about to read is a master thesis which is part of the graduation project of the Faculty of Industrial Design Engineering (IDE) of Delft University of Technology. Graduating at the IDE faculty means demonstrating your capabilities as Industrial Design Engineer to the University, society and myself. Besides demonstrating my capabilities, graduation for me also meant challenging myself to develop myself further as an industrial designer. I did this by challenging myself to become more acquainted with the Vision in Product Design method by designing a product–service system within the corporate context of PricewaterhouseCoopers Netherlands. I was part of the Experience Center during my graduation project. This thesis gives and in-depth view of the seven months long design process and the achieved result, a future mobility product–service system that aims at reducing future socio-economic inequality in the Netherlands by 2035.

I want to thank a couple of people who supported me throughout my graduation process which started early February with writing the project brief and ended on the 27th of August 2019 with my graduation presentation. First, I want to thank Matthijs van Dijk and Silje Dehli for the great support throughout the graduation project and the faith in me that I was able to pull off a Vision in Product Design process, with a difficult topic within a difficult context. I only succeeded because of the right feedback with pin-point accuracy which you gave combined with the time and effort you put. In the end this is what enabled me to truly grow as a designer during this project. Secondly, I want to thank Joris van Gelder from the PwC Experience. He supported my graduation from the beginning, when everything was still very vague and abstract, till the end when things came together and became real and concrete. Joris challenged me and brought out the best in me, leading to the result I am most proud of. Also, PricewaterhouseCoopers, in particular, the Experience Center, which played an import role throughout the project. I want to thank all colleagues that helped me getting further during my project. That includes the relaxin games of table football. I also want to thank my parents and sister for listening to my ideas and providing me with an outside view, and helping me determine whether my ideas still made sense. Thank you Mendel de Kok, my girlfriend, for her unlimited and unconditional support in everything I did throughout the whole project. Thank my friends for their honest opinions, ideas and fresh perspective on certain aspects of my project. And last but not least, all interviewees: Rajendra Sitompoel, Niharika Mahajan and Ingeborg Oostlander-Çetin. Your input during our conversations really brought the whole project to the next level in terms of viability, desirability and feasibility. It uncovered certain things in the design process that I was unable to see by myself but you were able to point out to me because of your expertise.

I hope that you, the reader, have fun reading this master thesis. That it may inspire you to look beyond the problems and the quick-fixes for any problem that you encounter. Also that it may help you in envisioning our future world, what it should look like and how to get there: towards a future that is described in this thesis.

Donovan Lewis
Delft, 15 August 2019



0.2 Executive summary

The general concept and meaning of mobility have been changing and evolving since the start of mankind. Mobility has become more than getting from point A to B. Mobility is changing from solely being a means to reach a specific goal into being a goal on its own. PwC also realized this. However, at this moment PwC has no vision to do something with this mobility paradigm shift for themselves or their clients. This graduation project focused on the development this mobility vision for PwC and a design based on this vision. This is formulated in the assignment: Design a meaningful product (- service system) that enables, facilitates or improves personal mobility, in the Netherlands, by 2035.

Through conducting research, I created a future context. The future context is composed out of twelve cases in which people are unable to take personal responsibility for their mobility. It prevents them from creating favorable conditions in which they and others are able to create a better self. Together with PwC I decided to focus on the increasing socio-economic inequality case because, positively contributing to that case is most in line with PwC's own vision. The selected case is about people are not able to take personal responsibly to effectively use their mobility to grow their prosperity or that of others, due to new (global) external factors.

I created a mobility vision for PwC that is focused at delivering a positive contribution to the above-mentioned problem. The goal of the vision is: PwC wants people to responsibly use their short-term mobility to create a better self. Essential is that the success of it depends on the increase and/or improvement in short- and long-term socio-economic prospects for themselves and others too. Moreover, these prospectives should honor the creation of a better world for flora and fauna. PwC can achieve this by: Creating with people's mobility surplus personal interdependencies, between people's short- and long-term socio-economic prospects.

Flock has been created to realize this vision. Flock is a mobility system, owned by the Dutch government, which uses road pricing to charge users based on their departure and arrival location of their journey. Users traveling from a geographical area, which is valuable for society, to another area which is less valuable will be charged less than vice versa. Flock calls these geographical 'mobility epicentres'. This leads to more socio-economic equality which is more uniformly spread in the Netherlands on the long-term. Additionally, Flock offers people the ability to participate in a nation-wide de-centralized mobility network. People participate by investing in it with a privately-owned product that is capable of providing mobility. This is called 'mobility virtualization'. If done successfully, the user will be granted access to means that are invested by others in the network that provide mobility. This can be in the same or different mobility epicenters. The government is in possession of a desktop application and the user, mostly Dutch citizens, are in possession of a smartphone app to interact with the mobility system.

0.3 Final result

A part of the final design of the mobility systems is the interface, a desktop application (right page) for the government and a smartphone app for Dutch citizens. The government is able to oversee all different areas with a score that indicates how valuable it is to society. More importantly, the government is able to determine the height of the road pricing of each area and grant mobility providers (on-demand taxi services, bike sharing services, etc.) licenses to operate in a certain mobility epicenter. Dutch citizens are with the app also able to look at the score of each area. This enables them to make well-considered decisions regarding their short-term mobility that affect both short- and long-term socio-economic prospective.


310789
321125
90089
Klundert
Current score
400073
Providers
Road pricing
More
TODAY
WEEK
MONTH
Klundert
Mobility Provider
Search Term
Grok
Status
Rotodyne
Active
Sensate
Active
Flexigen
De-active
License revoked
delete
return

0.4 Table of Contents

1.0 Introduction

This chapter introduces the problem statement, project goal, the client and the approach of this graduation project. It provides the reader all the necessary information to have good understanding of the starting point and desired end point of the project.

1.1 Problem statement

The general concept and meaning of mobility have been changing and evolving since the start of mankind. These past two decades, mobility has changed even more rapidly due to an increasing rate of technical and sociological developments (Sheller & Urry, 2006). Mobility has become more than getting from point A to B. Mobility is changing from solely being a means to reach a specific goal into being a goal on its own.

Mobility constellation
Mobility is complex due to its multiplicity and it is becoming even more complex. “Mobility systems are developing new characteristics. They are simply much more complicated, containing many elements and are based upon specialized and arcane forms of expertise.” (Sheller & Urry, 2006). A way to describe these characteristics is by using three aspects of mobility. Movement, meaning and practice. The enduring relations and structures between those three aspects of movement are called ‘Constellations of mobility’, reflecting society’s norms and values. (Cresswell, 2013).

Brief history about mobility
Throughout history different constellations of mobility have dictated how mankind lived in Europe (Cresswell, 2013). During the first constellation, the Feudal Constellation, people had a 7-mile mobility radius that was controlled by a king and his lords during the Middle ages. The Early Modern Constellation took place from the 14th to the 16th century. In this period, a class emerged known as vagabonds or vagrant. This led to the development of an early version of the passport, with the idea that a person belongs to a certain nation state or local community. These passports were needed because people were able to travel further than that 7-mile mobility radius. What followed upto the present day was the modern constellation. During this constellation, mobility was no longer seen as a local issue but as a national issue, because of the increasing numbers of people moving from one place to another and the ever-larger distances they covered. With this new development, words as ‘citizens’ and ‘foreigners’ came into language. Looking at the past, I believe that defining mobility as: the intention to move and the realization of this movement in geographical space, thus implying a social change (Kaufmann, 2012), covers all aspects of mobility. Looking at past mobility constellations is a good starting point to further explore present and future constellation in relation to meaningful forms of mobility and the embodiment of it. One that will match these future constellations.

Current state of mobility and client relevance
Current research is lacking in understanding of present and future constellations of mobility. As a result, it is unknown which forms of mobility, and which possible embodiment, are meaningful in present and future constellations of mobility. This project will focus on mobility in the Netherlands mainly, as most clients that PwC Netherlands (chapter 1.3) serves are Dutch. However, I will treat Dutch mobility not in isolation, because the Netherlands is an active member on the global theater. In this project the word ‘future’ is linked to the year 2035. A 16-year timeframe has been chosen, because it roughly corresponds with the most of PwC’s relevant project time-spans.

Considering the lack of understanding of future mobility mentioned above, the problem statement is as following:

Current and upcoming products, in the field of mobility, are not aligned with the present constellations and future constellations of mobility in a meaningful way.

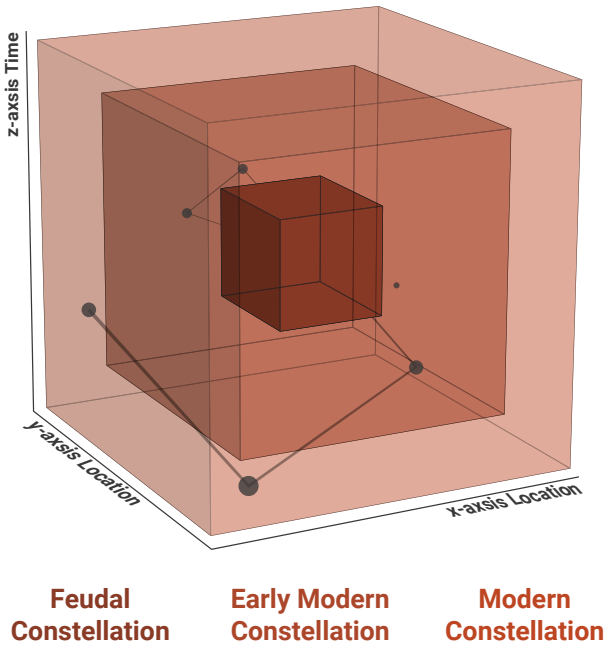


Figure 1 Figure: A visual representation of mobility based on the work from Van Acker, van Wee, & Witlox (2010). The horizontal plane represent a location (physical or virtual) and the vertical plane time. The line represents how a persons “moves”within their mobility space. The volume of the cube, total mobility, is defined by both intrinsic and extrinsic factors of an individual. It is clear that the total mobility of an individual grew throughout history.

1.2 Project Goal

The project goal is to answer the following questions:

- What is the current mobility constellation?
- What does a future mobility constellation look like?
- What form of mobility is meaningful in a future constellation?
- How does a system embody a meaningful form of mobility?

These project goals translate to the following design assignment:

Design a meaningful product (- service system) that enables, facilitates or improves personal mobility, in the Netherlands, by 2035.

The following elements are part of the deliverables of this graduation project:

1. A vision for mobility targeted at 2035
2. A mobility concept that demonstrates that vision
3. An embodiment of the proposed concept

1.3 Client: PricewaterhouseCoopers

Company description

The company PricewaterhouseCoopers Netherlands (PwC) is a multinational professional services network, formed in 1998 by a merge between Coopers & Lybrand and Price Waterhouse, headquartered in London, United Kingdom. PwC helps organizations and individuals to create the value they are looking for. They mainly do this by providing assurance, tax and advisory services.

Project relevance

This mobility exploration conducted in this thesis is relevant for PwC. This was confirmed by Marieke Baarslag, a director at PwC. Marieke focusses daily on mobility questions she receives from both private and governmental organizations. During a conversation she mentioned that the perspective on mobility is changing within PwC and her clients. In the past people had a rather vertical perspective on the mobility topic, meaning they thought it only has to do with moving people and goods from point A to point B via infrastructure. This perspective changed to a more horizontal perspective, one which includes a broader spectrum of topics and professions. It became a multidisciplinary subject. Therefore, a mobility design exploration is relevant to PwC. It is expected that valuable insights will be gained during this project that will reveal future challenges and opportunities for themselves and their clients that will change there perspective on mobility even more. Additionally, PwC has a track record with large projects that successfully aims at having an impact on future society. PwC often succeed because of their large network and in-house knowledge (fifth largest privately-owned company in the United States). Therefore, a highly complex and future-oriented project such as thesis presents, is an interesting way of exploring the future. It will identify possible opportunities and challenges for PwC that can be seized and solved by them.

Purpose and values

PwC has, like many other companies, a mission statement to communicate the organization's purpose and direction to its employees, customers, and other stakeholders. In the case of PwC they also call it their "Purpose".

"Our purpose is to build trust in society and solve important problems to ensure society has the confidence to imagine, build and grow."

Building trust is their unique selling point. It is involved in everything they do. PwC acting as trustworthy advisor is the main reason, and some the only reason, for clients to do business with PwC. Clients are assured that their issues, strategies, tactics and nowadays also data, are handled with the utmost care and respect. Therefore, the relationship between the firm and the client is considered as one of the most important and most valuable assets of PwC. This trustful relationship allows PwC to work closely together with the client to reach their goals.

To achieve trust, PwC has five values (Figure 3) that define who they are, what they stand for, and how they behave.

Figure 2 The PwC logo in front of the office in London

Act with Integrity	• Speak up for what is right, especially when it feels difficult • Expect and deliver the highest quality outcomes • Make decisions and act as if our personal reputations were at stake
Make a Difference	• Stay informed and ask questions about the future of the world we live in • Create impact with our colleagues, our clients and society through our actions • Respond with agility to the ever changing environment in which we operate
Care	• Make the effort to understand every individual and what matters to them • Recognise the value that each person contributes • Support others to grow and work in the way that brings out their best
Work together	• Collaborate and share relationships, ideas and knowledge beyond boundaries • Seek and integrate a diverse range of perspectives, people and ideas • Give and ask for feedback to improve ourselves and others
Reimagine the possible	• Dare to challenge the status quo and try new things • Innovate, test and learn from failure • Have an open mind to the possibilities in every idea

Figure 3 The different values that PwC has and the way in whcih these are translated to concrete actions.

1.4 Project approach

Many different methods and approaches are available within the field of industrial design. Each have their own specific strengths and weakness with regard to finding design solutions. I have chosen to use the Vision in Product design method (ViP) to find the best design solution that fits my problem statement.

Three aspects of ViP makes the design method stands out from other design methods. Firstly, the design method aims at the designing "the world of tomorrow" instead of solving the problems of today. Where other design methods focus a lot on problems and relating limitations or requirements to the solutions, ViP focusses on the possibilities and opportunities that contribute to various forms of increasing the quality of life for people. The fact that ViP is future focused is the main reason it fits well within this project. Secondly, making a meaningful impact in field of mobility is resource intensive and therefore needs to be carefully planned. ViP helps with that. Thirdly, ViP emphasizes the development of the raison d'être of the product in the future world. This is essential as it explains not only what to design (which is one of the sub-research questions) but also why the design fits in this context. Lastly, ViP allows the designer to pragmatically design with and for the wicked problems that comes with a topic like mobility.

Although ViP is a good design method for this particular project, it also has its limitations in this design project. As time is limited, so does the in-depth design detailing of this project. A considerable amount of time needs to be spent on doing research to the complexity of the mobility topic to be able to design something truely meaningful in and for it. Another limitation, or challenge, is using ViP in the rather conservative business environment of PwC. This environment fosters a workflow that aims at being as efficient as possible to answer a specific pre-defined problem. This style is broadly accepted and preferred at PwC because it enables them to better sell and manage projects based on hourly-rates and pre-defined deliverables. However, the insights and results will be valuable since they are original in the context of PwC.

Vision in Product Design

ViP is a human-centred design method that allows for careful examination and determination of what meaning should be offered to/created for people in a future world. (Hekkert & van Dijk, 2011). The main goal of ViP is to develop upfront a clear vision of how a new product needs to be perceived and experienced in the future. This is achieved by following a context-driven, and interaction-centered desgin approach in which a set of starting points or factors, ideas, observations, beliefs, or obsessions, will determine the future context, future interaction and ultimately the product-to-be-designed.

The ViP design method consists out of eight consecutive steps. However, several iterations may be needed within and between each step to make progression. A certain design choice can quickly be evaluated by looking at how it influences the result in the next step. For example, a certain human-product interaction leads to unwanted product qualities. This could indicate the need to review the prior defined human-product interaction. These steps form also the basis for my approach in this thesis.

1. Establishing the domain
2. Generation of context factors
3. Structuring of the context
4. Statement definition
5. Designing human-product interactions
6. Defining product qualities
7. Concept design
8. Design and detailing

Step 1: Establishing the domain

The first step is establishing a domain. The domain in the context of the ViP model is a description of an area of focus in which you want change something. Its function is to let me look at the world with a certain focus that allows me to make significant contribution to the defined area of focus. Therefore, the domain needs to be broadly defined while still fitting the strategic goals or mission of a client which is project owner. However, a too broadly defined domain results in dispersed focus and ultimately to no significant contribution at all. A more specific description of the domain with a timeframe in which the design is going to be realized will drastically improve the quality of the domain. For this project, the domain is defined as mobility and the timeframe 2035, as mentioned earlier. This is a broadly defined domain, because one of the goals is to define a meaningful form of mobility. To be able to do that, I need to have the conceptual space and freedom to do so.

Preparation phase

Normally, prior to step 1, the ViP method starts off with a preparation phase in which the current design is deconstructed. In this phase, the designer asks himself, "Why is this design the way it is?" There are a number of reasons to perform this step. Firstly, it functions as a warm-up for the ViP method. Secondly, it frees the mind of any preconceptions that consciously or unconsciously affect the design process. Lastly, if done right, changes in the design context become visible. These changes in context could give a sense of possible opportunities that may rise when forming the new context. Since one of the questions that I want to answer during this project is "What form of mobility is meaningful in a future constellation?" no specific product category has been pre-defined to which the 'to be designed product (- service system) needs to belong to. Therefore, it is not possible to deconstruct a product in the preparation phase, as determining what product is a meaningful form of mobility, is part of this graduation project. So, this graduation project will start right at the designing phase of the ViP model.

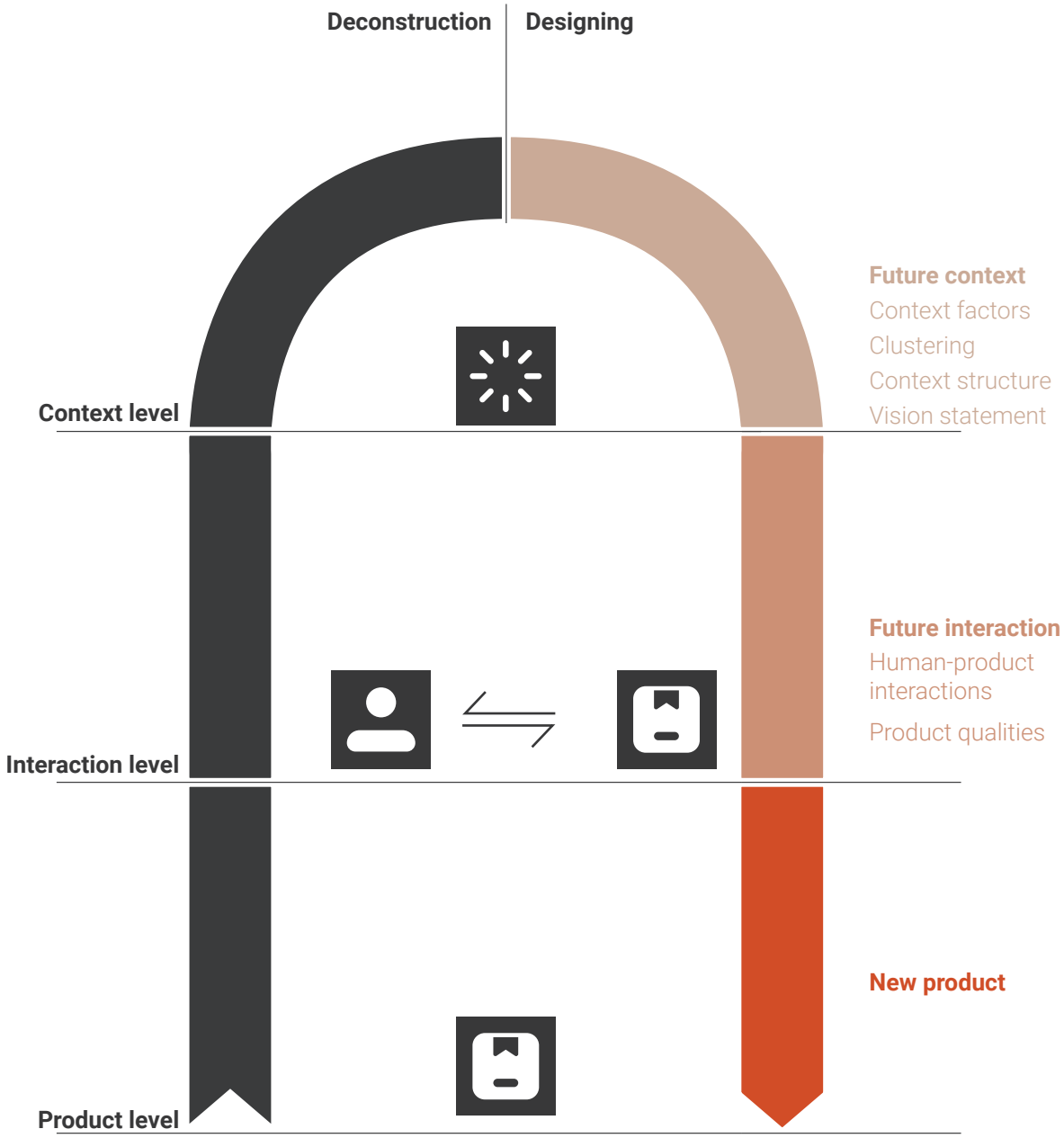


Figure 4 An adapted version of the ViP model (Hekkert & van Dijk, 2011). Abstractness is increasing when moving "upwards" in the model. Product level is the most concrete part of the project. This project mainly focuses on the design part. The different phases in the model correspond with the chapters in this report. Just like most design processes, ViP allows and stimulates a number of iterations per design step.

1.5 Design process

Figure 5 visualizes the actual course of the design process. You can see that it closely followed the VIP approach throughout the process. Do notice the differences in time spent for each step and the ratio between variety & complexity and unity & simplicity. Almost half of the time in this process has been spent on vision statement. The other half on creating and o working out a concept based on that vision.

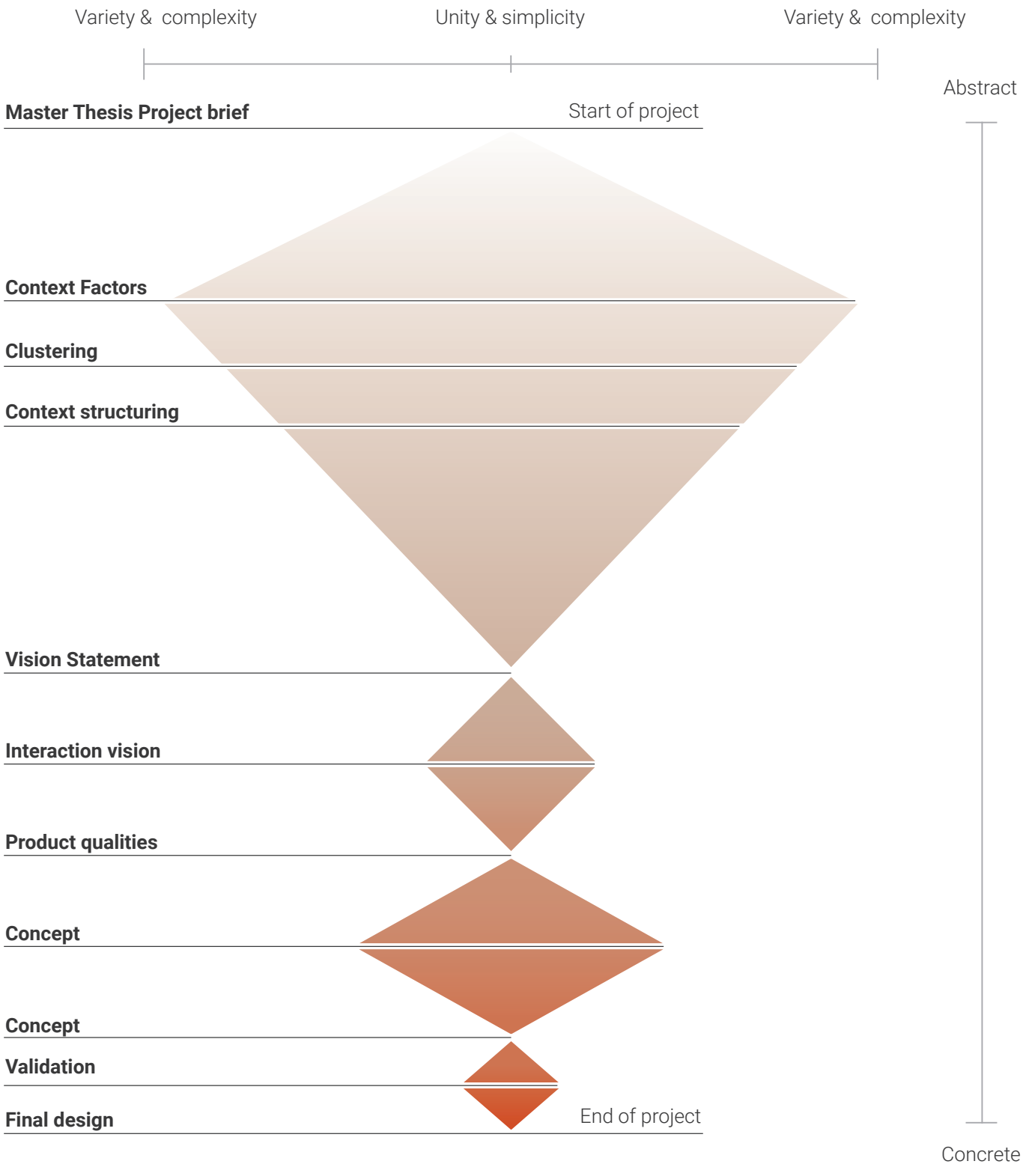


Figure 5 A visualization of the actual course of the design process. The project started 11th of February 2019 and ended on 27th of August 2019. That is approximately 7.5 months.

2.0 Future Context

What form of mobility will be meaningful in the Netherlands in 2035? To be able to answer that question, an extensive study about the future context is performed. This study makes use of value-free descriptions, of the present and future society, to precisely determine where the world is heading towards to and how people will behave in it. The outcome will greatly impact people's definition of what is a meaningful from of mobility in the future.

2.1 Building blocks of the future context

allows for careful examination and determination of what meaning should be offered to/created for people in a future world. This applies also to our perception of a meaningful form mobility. What may be considered meaningful today, may not be considered meaningful tomorrow. This is because the question: “What is meaningful?” is closely tied to our norms and values within society and our (personal) needs and wishes, changing over time.

Getting a good understanding about how the world looks and where it is heading towards, is essential to be able to answer that question. The first step to achieve this is by collecting context factors. Context factors function as the “building blocks” for every ViP design process. Factors are value-free descriptions of world phenomena around you (Hekkert & van Dijk, 2011).

It is important to consider the following four aspects, when collecting while collecting context factors, as it leads to the most useful and interesting design context. First of all, context factors need to be relevant to the chosen domain. In the case of this project they need to be relevant to the mobility domain. The factors need to help in the domain from a new and fresh perspective. Secondly, the factor should be interesting. It should excite and give the feeling of being “on to something”. The factor can be excluded if it is not the case. Exclusion can only be done if it is not a very relevant factor. Thirdly, some of the factors need to be original. ViP is a design method highly focused on original outcomes. Therefore, original factors are needed to increase the possibility to come to equally original results. Finally, it is important to have enough variety among factors. Often, your chosen domain unconsciously forces you to look for a certain type of context factor in certain field. For example, looking for economic developments in the domain of online financing. This could lead to a very predictable and unoriginal design context and solution. It does not leverage the potential value of a different type of factors from different fields. ViP encourages to look for at least four types of factors (Developments, Trends, States and Principles) in at least eight different fields (Cultural, Psychological, Demographic, Sociological, Economic, Biological, Evolutionary and Technological) to ensure a broad selection of factors is found.

I found a total of 148 context factors (see appendix A for the full list) in the mobility domain. Matthijs van Dijk and I came to this amount of context factors in order to make it still possible for me to find that number of factors and group them in different clusters during the limited time I have, while being thorough enough. Only collecting context factors does not give a good understanding about where the world is heading towards. The next section focusses on finding the hidden narrative among these context factors by clustering them.

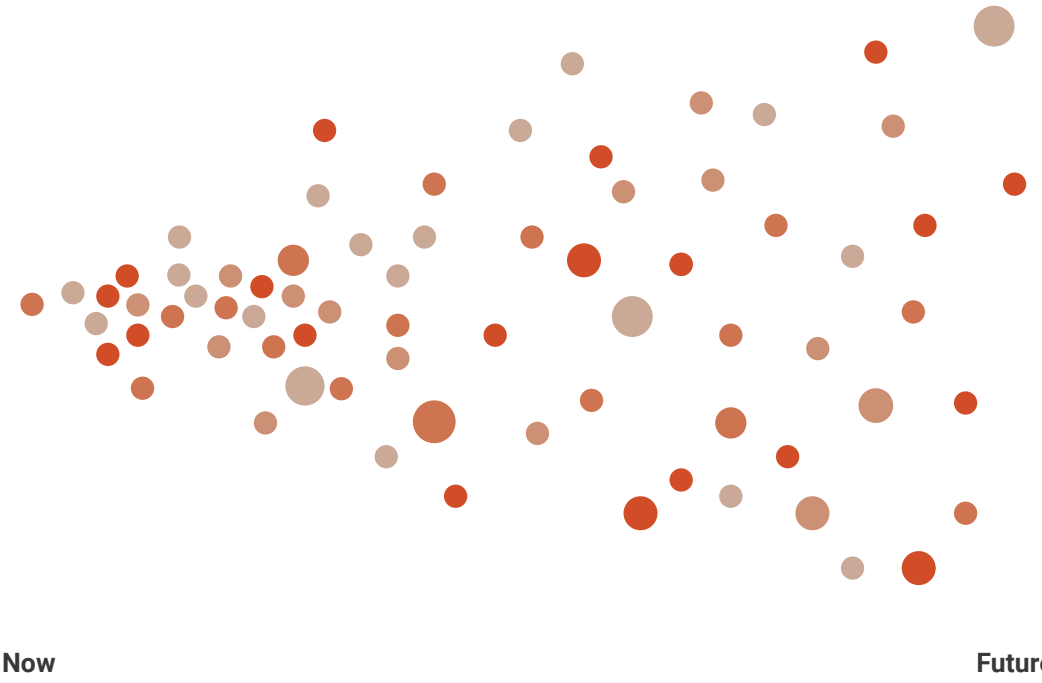


Figure 6 A schematic representation of different types of context factors from different fields shaping the possible future, or other said, most likely future context. Notice that the amount of context factors that say something about the future is declining. This is because there are less context factors about the far future than the near future. One could say that the future context is a somewhat an extrapolation of context factors. The more context factors you have the better is your estimation of the most likely future context in which the to be designed product (- service system).

2.2 The nine narratives (clusters) of the future context

While each context factor on its own provides interesting insights, real value can be obtained by clustering them. The main goal of clustering is to reduce complexity while retaining the “richness” of each factor, to be able to uncover the hidden narratives among these factors. It is about creating unity among variety. Here, the factors can be considered as building blocks of the future context. The clusters can be considered as the walls. More information about the clustering process can be found in appendix B.

Nine clusters among the found 148 context factors were identified. Five context factors were not used, as it turned out that they were not relevant in the mobility domain. The clusters are:

1. **Living in bubbles**
2. **Infinite trust in black box systems**
3. **Mainstream becomes the norm**
4. **Defending your autonomy**
5. **Unequal chances in life**
6. **Hypermarket differentiation**
7. **Being digital literate as a requirement to be part of society**
8. **Being occupied with creating the better self instead of living the moment**
9. **People do not take personal responsibility for a better world**

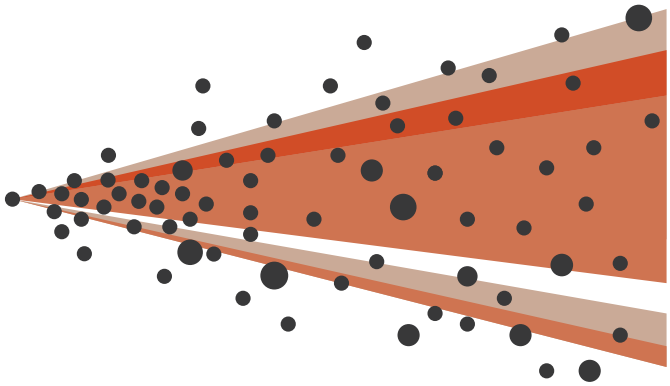


Figure 8 A schematic representation of different clusters (narratives) found among the earlier identified context factors.

The following paragraphs are going more into depth in each and every cluster. These descriptions are being constructed from the insights provided by the context factors. The orange numbers in the paragraphs correspond to the earlier found context factors which can be found in the appendix A.

1 - Living in bubbles

Many hands make light work. This is the same for collective thought. A lot can be achieved if there is something of which a lot people, more or less, think the same about it, believe in or trust **11, 12, 48, 52, 86, 98, 146**. However, groups still split up when the group gets too big or when there are internal conflicting fundamental believes **51**. These micro groups of a specific interpersonal space, or so – called bubbles, are currently very easy to form or find. In these bubbles, values, believes, ideas, opportunities and more, can be shared with other interested peers **14, 125**. Therefore, it is challenging to stay open-mined and accept other bubbles since more and more time is spent living in your preferred bubble(s). Also, big inequality differences may occur between different bubbles as social mobility is decreasing. Staying open-minded to other bubbles is important because a lot can be learned from each other **2**.

Figure 7 Cluster 1 - Factor **98** - Emergence is the spontaneous creation of sophisticated behaviours and functions from large groups of simple elements. Think of fish moving in a school, frozen water molecules being part of a snowflake

2 - Infinite trust in black box systems

An increased amount of processes and decisions in fields ranging from economics to sociology are being governed or even made possible by an increasingly large amount of data. Data about all kinds of personal and general information is playing a more dominant and important role in the lives of millions of people. **58**. This is made possible by complex algorithms that are being created to help us make sense of this data overload. These algorithms help us to process, organize and structure data, turning it into valuable information (Diffen, n.d.). In some cases it even enables the prediction of human behavior **107**.

To make use of this information, an increasing amount of people are making more use of systems to share information. Every day, new ways of sharing new kinds of information are continuously being researched and developed **109, 63**. Through this, society is slowly transforming into an information society. Which is defined as: *"A society characterized by a high level of information intensity in the everyday life of most citizens, in most organizations and workplaces; by the use of common or compatible technology for a wide range of personal, social, educational and business activities, and by the ability to transmit, receive and exchange digital data rapidly between places irrespective of distance"* (Rouse, 2005) Regulation concerning the collection and usage of information is becoming more important. Over time, society developed a lot of trust in information and algorithms. For example, a lot of people blindly trust the route Google Maps generates for them to get to their desired destination (Harari, 2018). Besides regulation, the education of people about the misuse of information is a way to prevent future misuse of this infinite trust in so-called black box systems: a system whose inner workings are not visible **1, 10, 103**.

3 - Mainstream becomes the norm

People like zero risk. When there is no risk involved people do not have to worry, which is experienced as comfortable. For this reason, people like eliminating any idea, object, person, place and so on, that may be perceived as risky. This creates the largest possible comfort zone. A zone in which they do not need to think about external risks **55, 74, 79.** A similar effect can be achieved by isolating risks. It structures risks which makes them more controllable, predictable and understandable resulting in a sense of power and thereby taking away the worries people may have **66, 67, 140, 141, 149, 150, 151.** By doing this on a large scale, a new mainstream is created in which everything that differs from this new norm is excluded or pushed to the fringes of society. The Dutch saying of "doe maar gewoon, dan doe je al gek genoeg" (just act normal, that's already crazy enough) Will become even more applicable in such society. These societal developments are not happening without problems. New problems, like people alienating from each other **89**, and being scared of other people and unknown places can surface by oversimplifying things and isolating them from each other **33, 50, 68, 130, 132, 133 135, 136, 142**.

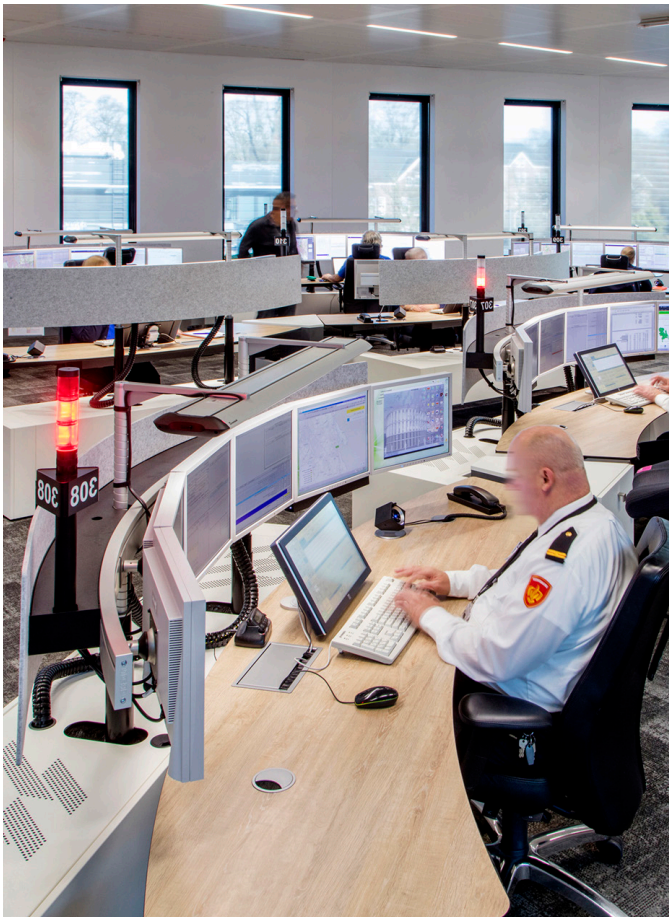


Figure 9 Cluster 2 - Factor **107** - The Dutch government is using more complex models, based on advanced algorithms. The government makes decisions and does predications with these models based on data of citizens.

Figure 10 Cluster 3 - Factor **141** - As a response on the 9/11 attacks, the Bush administration ramped up deportation efforts. From 2001 to 2012, there was roughly a 400% increase in criminal deportations in the USA. It's important to note that while most of the people deported were charged with a crime, they were not necessarily convicted of one.

4 - Defending your autonomy

Having ownership of your own body, will, thoughts and desires, without external interference, is being considered valuable and for almost everyone a fundamental human right **5, 6, 7, 8, 9, 20, 96 128**. People spent a lot of resources and energy to increase, or at least, defend a certain level of autonomy **54, 64, 72, 73, 77, 80 83, 97, 111 131 143**. Even if this has negative consequences for mankind as a whole **21, 119**. Therefore, people feel often attacked when others (people, objects, services) enforce certain limitations on them **76, 85, 101, 115, 134** or take away (parts of) their behavioral freedom from them like **44, 57, 78**. History teaches us that people, sooner or later, will use extreme measures to defend their autonomy, often at the expense of others autonomy or even other lives.

5 - Unequal chances in life

Almost anyone would likely agree with the statement that everybody has the right to a standard of living adequate for health and well-being for their selves and their families **13**. Despite improvements that increases the quality of life of certain people **23, 31, 34, 37, 71, 118 121, 127** there are still big in these life qualities **35, 36, 38, 53, 129.** Moreover, the overall gap between people that have an adequate living standard and those who have not, is still increasing **53, 110, 126, 139, 147.**

Differences in life quality ultimately impact people's chances in life, as social mobility theory teaches us. High inequality leads to less social mobility (Krugman, 2012). In other words, people have less opportunities to climb up on the social ladder when they have a difficult start.

Figure 11 Cluster 4 - Context factor **131**: Almost 80% of the Dutch that are 17 years or older have their driving license. At the beginning of 2019 almost 11,2 million Dutch persons have the personal car driving license B. That is 1% more compared to last year.

Figure 12 Cluster 5 Context factor **147**: 68.5 million people were forcibly displaced in 2017. The past decade has seen substantial growth in the global population of forcibly displaced people. In 2007, this population numbered 42.7 million; over the last 10 years, this figure has increased by over 50 per cent. Today 1 out of every 110 people in the world is displaced, compared with 1 in 157 a decade ago.

6- Hypermarket differentiation

People have the nature that when they want something, they want it to have it as soon as possible **26, 90**. This phenomenon is called instant gratification. Nowadays, organizations use this principle in an information society, combined with the latest technology, to hyper differentiate their market. A profile is created from an individual were after he or she is personally targeted with marketing campaigns. The result of this is allows for simultaneously consumption tailored to their specific needs and whishes linked to their lifestyle and personality **32, 56, 81, 112, 124**. It enables people to consume with unprecedented speeds anytime and anywhere **59, 93, 114**. This speed of consumption negatively affects our health **102**, that from others, future generations and ultimately the planet. While many people know this, they still fail to do something about it, as they believe it is not their responsibility but that of someone's else **3**.

7 - Being digital literate as a requirement to be part of society (distracts from the original goal)

Our "real" lives are more and more intertwined with our digital lives **28, 29, 47, 49, 106.** Digital systems like communication and entertainment are being used more often and more often play a significant role in how we fill in our time **88, 123**. This goes hand in hand with the information society as described in the paragraph *Infinite trust in black box systems'*. Although these digital systems greatly augment our real lives, it will not fully substitute the "real "counterpart for the time being **87**. They will co-exist and improve until they are fully merged with eachother at some point in time. For this to happen, digital systems need to move towards humans and humans need to move towards digital systems **4**. Therefore, being digital literate becomes an increasingly important requirement to be part of society.

Figure 13 Cluster 6 - Context factor **93**: Leisure has historically been the privilege of the upper-class. Opportunities for leisure came with more money, or organization, and less working time, rising dramatically in the mid to late 19th century, starting in Great Britain and spreading to other rich nations in Europe

Figure 14 Cluster 7 - Context factor **47**: The number of social media users worldwide will grow from 0.97 billion users in 2010 to 3.02 billion users in 2021.

8 - Being occupied with creating the better self instead of living the moment

To be able to be yourself, regardless of time and space, has a positive effect on how feel people feel about themselve. Nowadays, more effort is put into making this possible by offering people all kinds of options, to organize their lives to better fit their individual needs and wishes **40, 41, 42, 46, 75, 84**. Society is becoming a bit more individualistic, focusing on the creation on a better self. Moreover, living a live that better matches who you are leads not only to more happiness but will also have a positive impact on your overall health and well-being **25, 30, 65, 148**.

Still, having a better organized daily life that caters personal development solves not all problems. Our amount of leisure time declines due to our modern complex societies in which we can work anytime and everywhere. Live in general has become less bound to geographical locations **43, 94**. This leads to the issue that we sometimes forget to enjoy the moment, because most of our resources and attention is going to the creation of our future better self.

9 - People do not take personal responsibility for a better world

The world gets more crowded and people live longer **22, 120**. These are just two examples of aspects that put stress on the world's natural resources and the global society as a whole **16, 17, 24, 27, 61, 70, 152, 144**. Therefore, it should be everyone's responsibility to commit to the creation of a better world. The challenges the world faces today and tomorrow can be considered among the most difficult and biggest of all time. Being more sustainable in everything we do is essential if we want as many people as possible to life a good and prosperous life **13, 116**.

A lot of actions have been undertaken on a macro-level for becoming more sustainable. Most actions aim at decreasing the stress humanity puts on the environment **15, 92, 100, 153**. Also, being more efficient with resources by using the newest technologies is a used as a tool for becoming more sustainable **62, 104, 108**.

These positive developments on a macro-level are in stark contrast with becoming more sustainable on a micro level. In practice, people still experience being the act of being sustainable as difficult, unpractical or expensive. Also, it is difficult to see the benefits from being more sustainable in the future **113, 117**. Those are just two reasons people are not able or willing to take personal responsibility for a better future world. In some cases, they even give their responsibility to others **19, 122, 137, 138**. Forcing people to be more sustainable is not an option. It threatens, or sometimes even eliminates, people's behavioral freedom. If this happens people experience an adverse state of arousal called reactance **44** which is not desired.

Figure 15 Cluster 8 - Context factor **42**: Employees appreciate having the option to work when they want and where they want: it leads to higher levels of perceived flexibility, which leads to higher levels of work-life balance, which in turn leads to higher productivity.

Figure 16 Cluster 9 - Context factor **15**: The Netherlands need to reduce CO2 emission with 49 percent by 2030

2.3 Driving forces of the future society

Any society changes. The shared collections of norms and values and how we interact with each other changes depending on the needs of a society to further develop and what they wish to achieve. These needs and wishes can also be called the *Driving forces* of society. In a typical ViP design process, such as this graduation project, *Driving forces* function as the “guidelines” to form the basis of the future context in which the to be designed product is going to exists. These forces are being selected from the earlier found clusters, or other called, narratives. Eligible clusters are those that, just like the clusters, reduce complexity while retaining the “richness” of each cluster. They uncover the hidden thread that connects all earlier found narratives and will have the most impact on human behavior. The ViP method calls this “context structuring. More information about context structuring can be found in appendix C.

Being occupied with creating the better self instead of living in the moment and **People do not take personal responsibility for a better world** have been identified as the two *Driving forces* that shape the future context for the to be designed mobility product (– service system). Clusters 1-4 belong to People do not take personal responsibility for creating better world and clusters 5-7 to Occupied with creating the better self instead of living in the moment.

The next section reveals the thread that connects all identified clusters into one cohesive future context.

2.4 Twelve mobility conflicts in a future context

The Driving forces function as the guidelines that shape the future. They reveal the hidden connection, or thread, between the earlier identified clusters. The driving forces **People do not take personal responsibility for creating better world** and **Being occupied with creating the better self instead of living in the moment** reveal that there are 12 mobility conflicts in the future context. In these conflicts people are not able or willing to take personal responsibility to effectively use their mobility to increase their prosperity or that off others.

An overview of these 12 different mobility conflicts is given in Figure 18. The clusters 1-4 are placed on the horizontal axis which are different expressions, or definitions, of the driving force ‘People do not take personal responsibility for creating better world. Vertically, clusters 5-7 are places which are different expressions of ‘Being occupied with creating the better self instead of living in the moment. The descriptions of each conflict is about what the world will look like in the future and how people will behave in it.

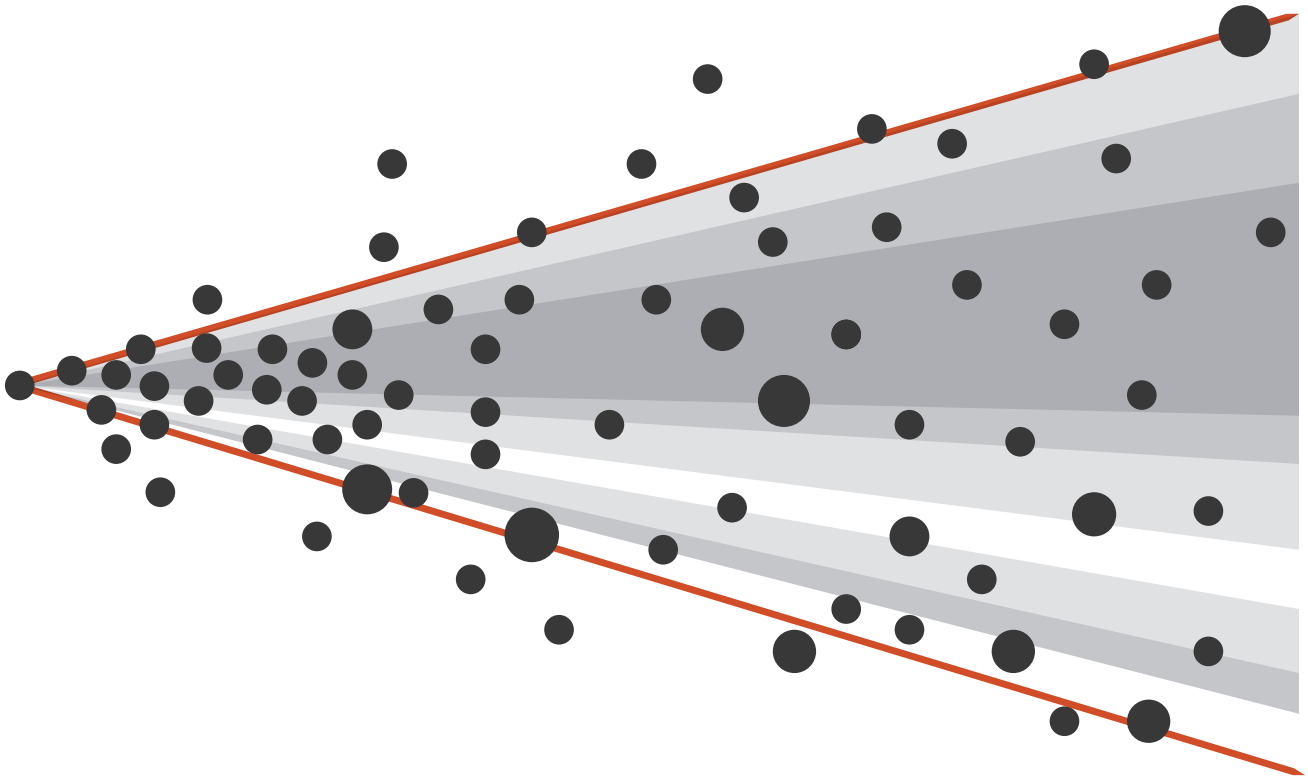


Figure 17 A schematic approximation of the driving forces functioning as the guidelines for establishing the future context. The orange lines are the driving forces. The gray areas are other clusters. The black dots are the context factors.

Driving force: People do not take personal responsibility for creating a better world

1 - Living in bubbles

2 - Infinite trust in black box systems

Driving force: Being occupied with creating the better self instead of living in the moment

5 - Unequal chances in life

1.5 There will be a socio-economic gap between the upper- and lower class. Also, it becomes more difficult to move up into a higher class. A meritocratic approach, working hard to be better off, is losing its effectiveness. There are new (global) external factors, that shifts life being complicated to complex. Especially the people in the lower classes become dissatisfied with the, in their eyes, unfair position. They start demanding and adopting a more populist approach hoping life becomes less complex and easier. This leads to people are becoming more alienated from each other.

2.5 Black Box systems were initially introduced to create valuable information from the enormous amount of available data. Information that could be used to make well-informed decisions that are beneficial for society. Sadly, the trust that people have in these systems is declining. These new emerging technologies are scaling so fast that it outpaces policymakers, regulation and even the understanding of the end-consumer. This leads to a lower degree of trust making people more hesitant and suspicious to adopt and use (new) technologies.

6 - Hypermarket differentiation

1.6 Voluntary or involuntary, living in a certain bubble has direct effects on your social position and your identity as consumer. In the future the gap between different bubbles will increase since people have increased possibilities to obtain what they want without interacting with too many different bubbles that are different than their own. This results that people are increasingly surrounded with resources and norms and values similar to their own. It becomes more difficult to make use of, or improve yourself, with different opinions or resources. People will become less open-minded to try new things. They are only able to enjoy the things that fit their bubble.

2.6 Black box systems will become the main factor that decides your personal identity. Therefore, mainly quantitative data will form your personal identity. These same systems make also sure that you are being continuously (involuntary) presented with products and services that fit your preferences without knowing exactly what it is based on and how to influence it. This is a process in which human emotion and interaction has no place. Ultimately people will start yearning for more authentic human interactions in society.

7 - Being digital literate as a requirement to be part of society (distracts from original goals)

1.7 Being digital literate is more often a requirement to live in certain bubbles. It is because social, economic and cultural aspects of life are happening more in digital environments or, are in some way affected by it. That is the reason people are becoming more invested in their digital lives. However, the more they are invested in this digital society, the more the get detached from the real world. On the contrary, people who are not sufficiently invested in this digital society, or do not want to be that invested, will have a reduced number of opportunities (social, economic).

2.7 In the future, people will be living lives that are mostly defined by (dynamic) digital borders, rules and tools. People will feel helpless and vulnerable in the event that these digital entities are (temporarily) not available or if they are unable to interact with it. It is during these moments that people realize the magnitude of the impact of these technologies on their lives, their dependence on technology and their own capabilities.

3 - Mainstream becomes the norm

3.5 The mainstream is defined as the current popular thought that is widespread. However, this mainstream thought is getting more narrow-minded. In other words, society is polarizing. You are pro something or against something. Options, behaviors, thoughts or actions, to name a few, that differ a little from the norm or do not fit within the pre-defined borders are being rejected. They are pushed quicker to the fringes of society as they are less compatible with society. This causes people to be more careful when expressing themselves because they are afraid of being excluded from society. Some people will not try to live conform the norm. These people will try to find other ways to be who they want to be without being judged.

3.6 The future society will be more egocentric-focused. At the same time, society expects individuals to only belong to one social group and act accordingly. To which social group you belong is mainly communicated through the lifestyle that belongs to that group.

3.7 A part of society will break (in)voluntary loose from the core society. There are mainly two reasons for this. Firstly, they will break loose because of disinterest in adopting digital tools and skills. Secondly, they have difficulties in adopting the digital tools and skills. For example, they are unable to cognitively interact with these systems or their preferred tools are incompatible with society uses. These people will be (un) consciously disadvantaged.

4 - Defending your autonomy

4.5 The influence that society has on the personal autonomy is increasing. Everyday, there are more and more organizations, products and services that influence in some way our autonomy. As a result of that, society moves to a more closed social system. A social system which is more closed means a society with a lesser degree of social mobility and a society in which your position is more likely to be ascribed instead of achieved. People will become antagonistic to this more closed society as their freedom is restricted.

4.6 How and what people (in)directly consume will be a more important indicator for who they are. Therefore, people want to have more control on how and what they consume. This enables empowers them to control who they are or want to be. This is the reason that privacy and how to manage it will become an even more important topic in the future.

4.7 Besides being digital literate is a personal responsibility, having a certain level of digital autonomy is becoming more important in the future as well. Initiatives like the General Data Protection Regulation demonstrate are just the start of a future in which having a certain level of digital autonomy is a rule rather than an exception.

Figure 18 The twelve mobility conflicts in a future context. The clusters 1-4 are placed on the horizontal axis which are different expressions, or definitions, of the driving force People do not take personal responsibility for creating better world. Vertically, clusters 5-7 are places which are different expressions of Occupied with creating the better self instead of living in the moment. PwC expressed their interest in resolving the conflicts with a green number due their socially disruptive nature.

2.5 PwC wants to fight socio-economic inequality

Mobility conflict 1.5 in the future context was selected in consultation with PwC to focus on within this project (Figure 18). The choice should resonate with their mission and vision as company. This conflict will form the basis of the vision statement and will be used to design an intervention for.

The descriptions of these mobility conflicts, found in Figure 18, are about what the world looks like in the future and how people will react to it. PwC expressed most interests in mobility conflicts that are highlighted with green in the first row and the first two columns during various meetings because these resonates the most with their vision "Our purpose is to build trust in society and solve important problems to ensure society has the confidence to imagine, build and grow".

There was in particular great interest in solving conflict 1.5: *There will be a socio-economic gap between the upper- and lower class. Also, it becomes more difficult to move up into a higher class. A meritocratic approach, working hard to be better off, is losing its effectiveness. There are new (global) external factors, that shifts life being complicated to complex. Especially the people in the lower classes become dissatisfied with the, in their eyes, unfair position. They start demanding and adopting a more populist approach hoping life becomes less complex and easier. This leads to people are becoming more alienated from each other.*
PwC was most interested in this conflict, particularly in the prevention of it, because it is the most in line with their vision as a company. The conflict describes a socially disruptive problem. A problem which could have far reaching implications for society if it is not properly addressed. All other conflicts were in essence technical problems, commercial opportunities or political issues. These are topics that PwC also deals with, but it is not their main driver or "raison d'etre" for why they do what they do on a daily basis as organization or mainly what they want to be associated with. They want to be seen by society as a trustworthy company that cares about the society and not only focusses on earning money. Positively contributing to the mobility conflict helps them to convey that message.

Additionally, in the past PwC has selected four sustainable development goals (SDG's) to link to their vision as a company, to give more substance to their corporate responsibility strategy. SDG's are 17 global goals formulated by the United Nations General Assembly in 2015 for the year 2030. (United Nations, 2015) The four SDG's selected by PwC resonates with their desire to deliver a positive contribution to solving mobility conflict 1.5 (PwC, n.d.). The resonating SDG's are:
SDG 8: Decent work and economic growth
SDG 10: Reduced inequalities
SDG: 12: Responsible consumption and production
SDG 16: Peace and justice and strong institutions

Figure 19 The four sustainable development goals PwC selected to give their more substance to their corporate responsibility

3.0 Vision statement

Having defined the future context, a better understanding is created about what the future world will look like and how people behave in it. With this knowledge, I can effectively define what I want to achieve in it, and how to realize it. The ViP approach calls this establishing the vision statement. It defines my moral position as designer to the observed changes that are happening in the world besides the goal I want to achieve and the mechanism to reach it. Since this PwC is client, creating this vision statement will be done partially in consultation with PwC to ensures that it fits their vision and mission as well.

3.1 Format

Defining the vision statement is a pivotal moment in the ViP process. During this activity, all generated implicit knowledge, experience, values and believes will be made explicit by defining my attitude within the future that the client finds most interesting. This will be done with a statement that defines if I 'fight' or 'support' the developments discovered in the future context. The statement encompasses what should be achieved, and how to achieve this. All of this is being done with the complete future context in the back of the mind.

The main goal of ViP is to develop upfront a clear vision of how a new product needs to be perceived and experienced in the future by people. The statement is used to capture this in terms of the desired effect and the mechanism to achieve this. It should give direction to possible concept directions without defining what the actual product will be or does. More about theory of establishing the vision statement can be found in the appendix D.

I chose to deviate a little from the standard format for the statement. I experienced earlier during the structuring of the context process that the domain mobility is very complex and that I needed a slightly different approach to capture all the contextual richness. I decided to do that as well for the statement. I came up with the following format:

In a world where... – This part describes a part of the future context (selected in consultaion with the client) on which the to be designed mobility product focusses.

PwC Wants... – The effect that PwC wants to achieve in this future is defined here

By... – The mechanism that has been proven to achieve the desired effect.

This format allowed me to give additional attention to the future context within the statement to make sure that it is not too generic, already more focused on a specific part of mobility. The final statement can be found on the next page. The following paragraphs elaborate on the different elements of the vision statement.

3.2 In a world where...

Socio-economic inequality, *due to* **new (global) external factors**, *disables people to take personal responsibly to effectively use their mobility to grow their prosperity or that of others.*

There are a couple of concepts within the future context (*In a world where...)* that need further explanation to understand the far reaching implications of these concepts on society and mobility of the future. Those concepts are socio-economic inequality and global external factors (globalization). These concepts are being discussed in the following paragraphs.

Socio-economic Inequality
Inequality is a complex, but important topic within society. So it is not strange that there are different studies, in different fields, that focus on getting a better

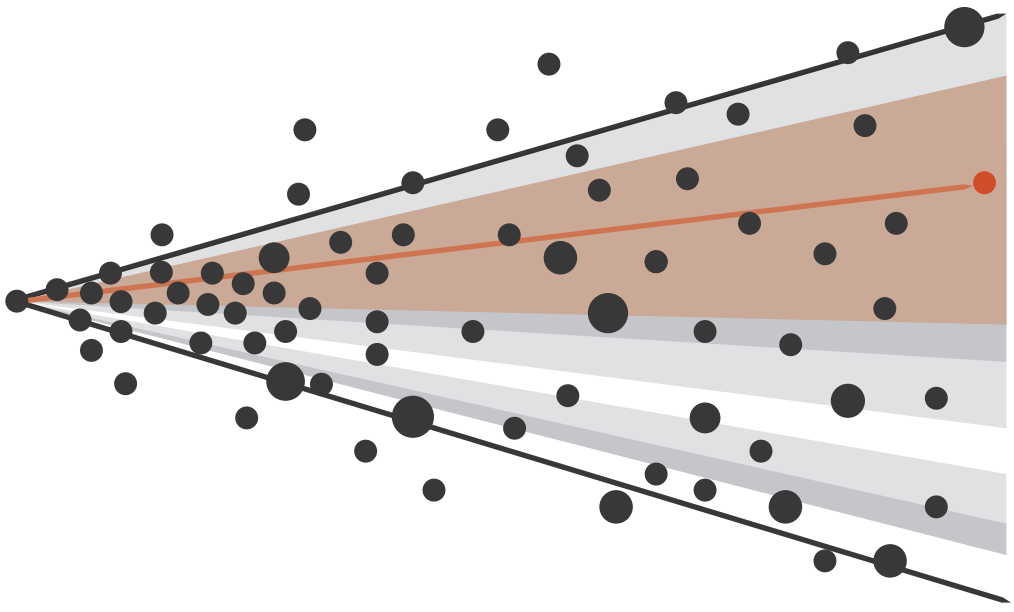


Figure 20 This schematic visualizes the statement. "In a world where..." (triangular form) defines the future PwC and myself want to make a contribution to. "PwC wants..." (the dot) is the desired effect and "By..." (the line) the mechanism to reach the goal. The black dots are other context factors and the grey area's other possible futures as defined in the earlier discussed on page 26 & 27.

understanding on inequality and what the impact is on society. The concept of inequality — the state of not being equal, especially in status, rights, and opportunities —is a concept which is at heart in many of the social justice theories. (UN - Department of Economic & Social Affairs, 2015) However, it tends to mean different things to different people, depending on their background and the context of the discussion, making the topic even more complex. In general, the understanding of inequality has evolved last years. Human well-being was traditionally determined by the amount of income. This works in an industrial society where the economic goal is the prevision of goods and the social motivators are mostly extrinsic (money, material, etc) However, as mentioned in the globalizations section, society moves away from these industrial norms and values and moves towards the new norms of values that come with a service society. Therefore, this way of determining well-being does not apply anymore. This service society is increasingly more occupied with providing (intangible) services instead of providing goods. Additionally, these services are more focused on satisfying the intrinsic motivators. Intrinsic motivators are for example, increasing social capital (the potential of individuals to secure benefits and invent solutions to problems through membership in social networks (Encyclopedia Britannica, n.d.), to live more environmental friendly and to have a better work-life balance. These intrinsic motivators cannot be captured and quantified correctly purely by money. The growing consensus that well-being is also determined by the (social) opportunities one gets during a life time confirms this. Additionally, international communities start to agree with each other that true human well-being is sustainable on the three dimensions: economic, social and environmental. (United Nations, n.d.). This makes the concept on inequality even more complex.

Still, the negative effects of inequality remain despite different definitions and measurements of inequality. Figure 22 shows the negative effects that inequality has on the average European country. What is interesting, is that the negative effects of inequality are not only experienced by those who are worse off than others. Inequality is a societal problem which effects everybody. This means that the increase in inequality concerning mobility will not only affect those who are directly affected but also those who live in the same society.

Globalization

The concept of the world becoming more interconnected through trade and culture exchange is not new. Globalization has been taking place several hundred years already. Think of the Chinese silk roads that existed in the 1st century BC, the spice routes that existed during 7th - 15th century and the rise of VOC in the same period (Vanham, 2019). The sudden increase developments with regards to globalization is what kept society busy approximately the past 50 years. (BBC, n.d.). This is partly due to the development of the internet, which drastically increased reach and speed of human communication (technologies), such as e-mail, internet of things, video calling, and capital movement. On top of that, financial markets became intertwined with each other and the nature of global social relations changed drastically. (Borcuch, Piłat-Borcuch, & Świerczyńska-Kaczor, 2012) Globalization has led to increased international trade, multinational companies (MCs), a greater dependence on the global economy and freer movement of capital, goods, and services. This is one of the reasons why many societies transformed from an industrial society into a post-industrial society. (Touraine, 1971). This means that most wealth is generated by the service sector (intangible goods, like ideas, knowledge, experiences and alike) rather than the manufacturing sector that mostly exist out of blue-collar – and manual labor (provision of goods). The economic outlook changes. This economic development also changes people's social outlook (see Socio-economic Inequality section).

Positive effects of globalization are that MC helps countries by providing new jobs and skills for local people, MCs bring wealth and foreign currency to local economies and ideas, experiences and lifestyles of people and cultures previously not available in their countries (BBC, n.d.). On top of that, globalization helped to making people more aware of global issues and events such as deforestation, the 2004 tsunami and global warming and alerted them to the need for collective aid or sustainable development. Negative effects of globalization are that it mainly operates in favour of the richest countries. There are no guarantees that the wealth from inward investment will benefit the local community in the end. Globalization could potentially drown out cultural diversity and possibly cause pollution of the environment, safety risk or poor working conditions and low wages on local workers due to lack of international regulation. Concluding, at one hand globalization is creating more wealth, but on the other hand it is not directly closing the gap between the rich and the poor.

Effects of globalization on mobility

The globalized society of today is focused on individualization, reflexivity, social differentiation and increasing socialization, commoditization and regulation (Ascher, 2017). Based on this, Ascher developed the "Hypermodernity" theory. This theory argues that *"the modern individual, who, he feels, faces a widening range of identifications, values and rules, which are simultaneously present in different worlds and uses the urban space to find the means of satisfying them"*. Allemand builds further on this theory by specifically highlighting the links between the attributes of people, places, technical systems and values that individual's relationship has to urban space-time. This is called hypermobility. It is the ability to move in many different ways, both in person and remotely (digitally). The goals of being hypermobile in a globalized society is to successfully move between different social worlds, to be reflexive, and to build a personalized lifestyle and set of values that reflect your identity (Sylvain Allemand, 2004).

In a world where...

Socio-economic inequality, due to new (global) external factors, disables people to take personal responsibly to effectively use their mobility to grow their prosperity or that of others.

PwC wants...

People to responsibly use their short-term mobility to create a better self. Essential is that the succes of it depends on the increase and/or improvement in short- and longterm socio-economic prospects for themselves and others too. Moreover, these prospectives should honor the creation of a better world for flora and fauna.

By...

Creating with people's mobility surplus personal interdependencies, between people's short- and long-term socio-economic prospects.

Figure 21 The vision statement of this design project.

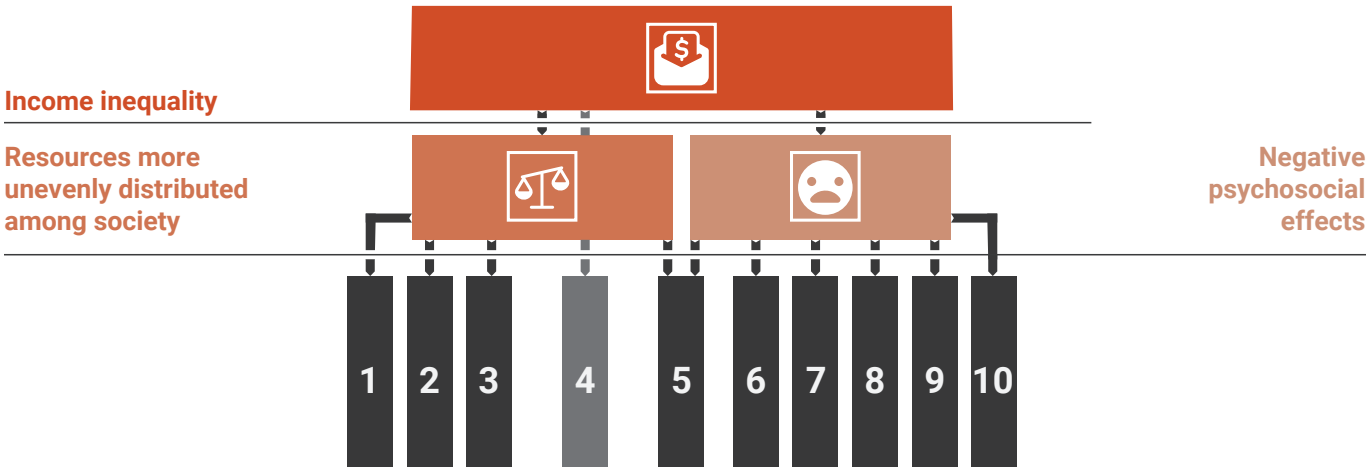


Figure 22 : Kremer, Bovens, Schrijvers, & Went (2014) identified 10 negative effects on society due to income inequality. 9 of those apply on European countries. Effect 4 – subjective health, criminality, family formation, social participation does not apply on European countries. The remaining negative effects are 1 – Quality Housing, 2 – Social mobility, 3 - physical complaints, 5 – Personal well-being, 6 – Social and institutional trust, 7 – Mental health, 8 – Political participation, 9 – status greed, 10 – Opinion on democracy, Euroscepsism.

A concept which is closely related to hypermobility is motility. Motility is about to what extent the individual able is to be hypermobile. Vincent Kaufmann (2002) defined motility as following; *"the set of characteristics that enable people to move from one place to another," in other words, the physical means, the earnings, the aspiration to either a sedentary existence or to mobility, the social conditions needed to be able to access the available technical systems of transport and telecommunications, plus acquired knowledge such as training, a driving licence and knowledge of international English in order to travel etc."* In short, it's about the social conditions that need to be met, the required skills and the means that are available to an individual to be hypermobile.

Not having any, or not being able to grow your motility on average as fast as society does has a large impact on the individual social and economic life. The more hypermobile society becomes the more certain groups are excluded from and/or disproportionately impacted by the system (S. Kenyon, 2003). Kenyon et al. calls this transport-related social exclusion. It is defined as following:
"[It is] The process by which people are prevented from participating in the economic, political and social life of the community because of reduced accessibility to opportunities, services and social networks, due in whole or part to insufficient mobility in a society and environment built around the assumption of high mobility"

Lucas, van Wee, & Maat (2016) captured five components of the mobility systems that lead to reduced accesibilty, and so hypermobility, that prevents certain groups of people to participate in the economic, political and social life of the community. This in line with the social exclusion theory and would appear to confirm the multidimensional nature of the problem. The five components are:

1.Individual component – *"reflects the needs (depending on age, income, educational level, household characteristics etc.), abilities (depending on people's physical condition, availability of travel modes etc.) and opportunities (depending on people's income, travel budget, educational level, etc.) of individuals. These characteristics influence a person's level of access to transport modes (e.g. being able to drive and borrow/use a car) and spatially distributed opportunities (e.g. have the skills or education to qualify for jobs near their residential area), and may strongly influence their total aggregate accessibility levels."*

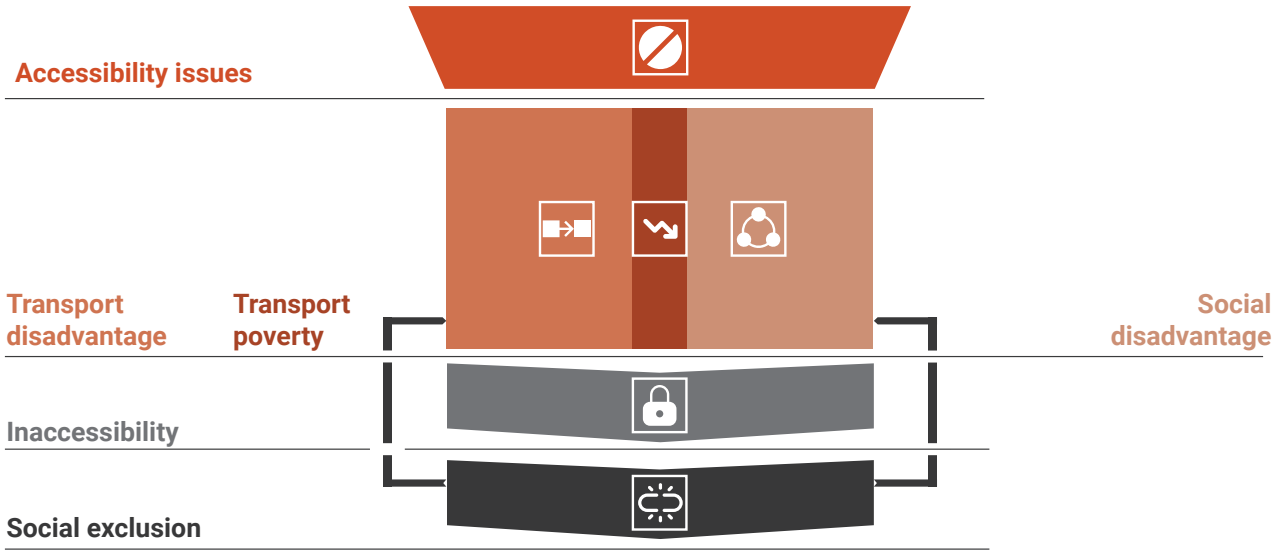


Figure 23 Diagram to illustrate the the relationship between transport disadvantage, social disadvantage and social exclusion (Lucas, 2012). These relationships exists in, and influence, social norms and practices, economic and political structures, governance and decisions frameworks.

2. Land-use component – *"reflects the land-use system, consisting of (a) the amount, quality and spatial distribution of opportunities supplied at each destination (jobs, shops, health, social and recreational facilities, etc.), (b) the demand for these opportunities at origin locations (e.g. where inhabitants live), (c) the confrontation of supply and demand for opportunities which may result in competition for activities with restricted capacity such as jobs, school vacancies and hospital beds (Van Wee et al. 2001)."*

3. Transportation component – *"describes the transport system, expressed as the disutility experienced by an individual when covering the distance between an origin and a destination; included are the amount of time (travel, waiting, parking), costs (fixed and variable) and comfort-related variables (such as reliability, level of comfort, accident risk, etc.). This disutility partly results from the conflict between supply and demand of infrastructure capacity. The supply includes the location and characteristics of transport services (e.g. maximum travel speeds, service frequencies, safety, reliability, public transport timetables, travel costs, etc.). The demand for infrastructure can relate to both passenger and freight travel, but in this case only passenger travel is considered."*

4. Temporal component – *"reflects the temporal constraints, i.e. the availability of opportunities at different times of the day, and the time available for individuals to participate in certain activities (e.g. work, recreation). Note that this temporal component has enjoyed a rapid increase in popularity amongst academics in transportation and geography (e.g. Schwanen & Kwan 2008) and usefully serves to illustrate that some social groups, particularly women, can become excluded from participation due to their work/home responsibilities and time budget constraints."*

5. Cognitive component – *"ability to interact with the transport system. This would include experience of the transport system, confidence whilst travelling, people's travel horizons and other cultural factors. These factors are especially important when considering the needs of certain social groups, such as people with mental disabilities, low literacy skills or ethnic minority populations. "*

These five components that relate to transport-related social exclusion, suggest that we should not only concentrate on the populations that are currently excluded or at risk of (social & transport) exclusion but focus on all people within a society. The ever-globalizing society brings escalating dynamics of hypermobility with which in turn has widespread effects across society

as a whole if people are not able to grow their motility accordingly (Urry, 2000).

To conclude, socio-economic inequality will increase because of a selected group of people who is hypermobile and so has the most socio-economic opportunities to develop themselves and people close to them. The remaining group of people has less socio-economic opportunities because of their motility being less compared to the hypermobile people. There are relatively even more disadvantages since the future world prefers hypermobile lifestyles.

3.3 PwC wants...

People to responsibly use their short-term mobility to create a better self. Essential is that the succes of it depends on the increase and/or improvement in short- and longterm socio-economic prospects for themselves and others too. Moreover, these prospectives should honor the creation of a better world for flora and fauna.

Within this goal short-term mobility mostly means mobility that has to do with short temporalities. Think of your daily commute or a journey you make to visit a friend. Those are the journeys from which you know roughly the beginning and end of in advance which fall under short-term mobility. This is different compared to long-term mobility which mostly involves long temporalities without a clear end. Examples of this are moving to another city or even migrate to another country. People make frequent choiches regarding their short-term mobility to let it fit their personality. It more receptive to induce behavioral change compared to long-term mobility which it makes more useful tool for people to create a better self while increasing and/or improving short- and long-term socio-economic prospects of yourself and others. Eventually, this should lead to more mobility from a higher quality seeping through from the upper-class to the lower class.

3.4 By...

Creating with people's mobility surplus personal interdependencies, between people's short- and long-term socio-economic prospects.

Mobility surplus is the unutilized mobility that people have. Think of cars not being used most of the time, vacation homes not being used, paid flight seats which are not filled or old (smart)phones laying in a cabinet doing nothing. But also think of people driving alone most of the time, mobile data plans not fully utilized or empty offices not being used. Besides these, many more examples can be thought of in which there is a mobility surplus that could be beneficial for someone else. By creating personal interdependencies with this surplus between people's short- and long-term socio-economic prospects, people are becoming more aware of the effects of not using this surplus the right way.

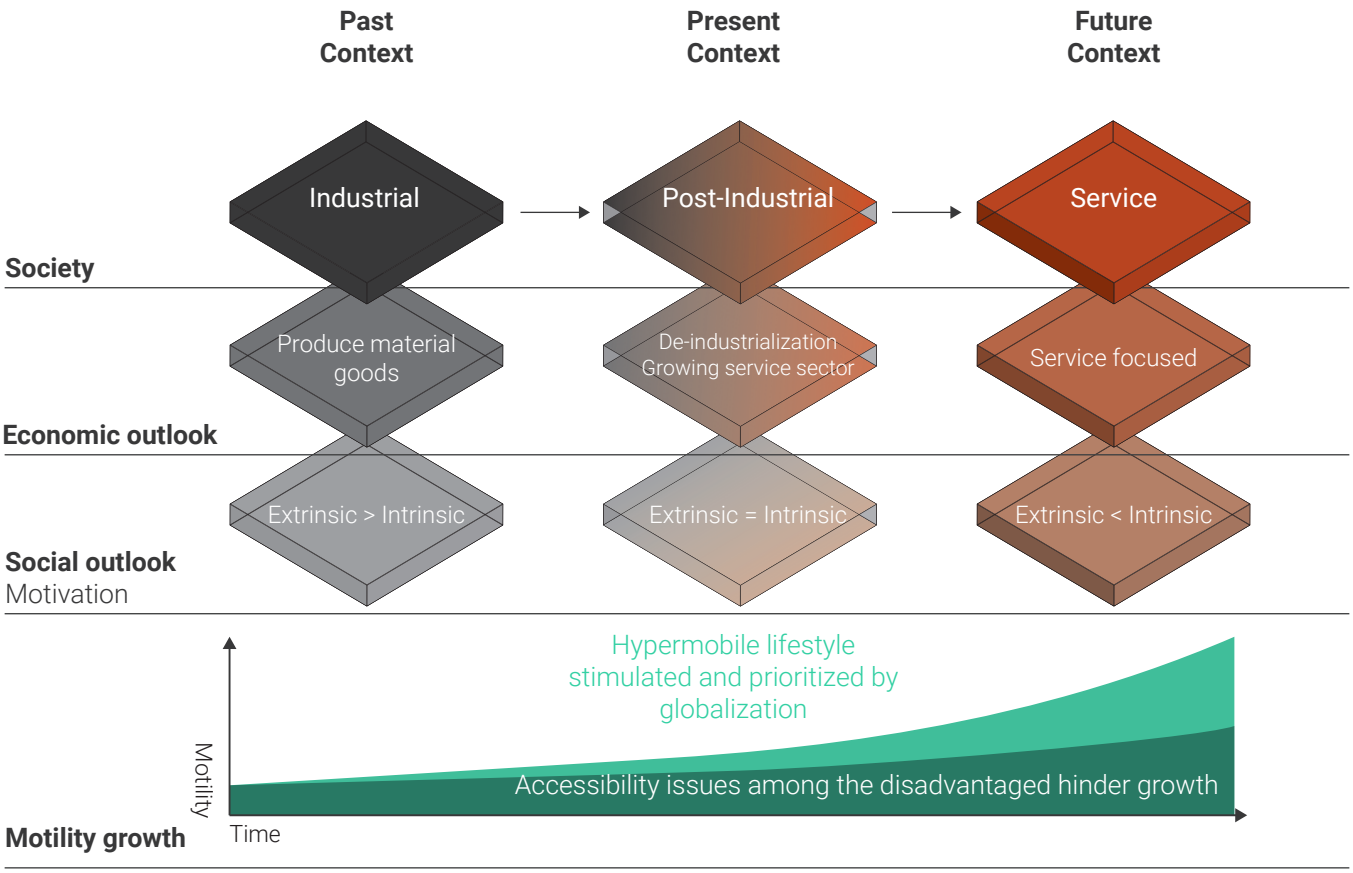


Figure 24 A visual representation of the past, present and future context and motility growth.

4.0 Future Interaction and Product Qualities

A future context and vision statement have been created in previous chapters. The coming chapter focuses on defining the desired and appropriated human-product interaction and related product qualities that makes the vision comes to life. An analogy will be created which will function as the backbone of the future interaction and reveals related product qualities. The analogy and product qualities are the last element to add to the future mobility vision which also form the link between the future context and the to be designed product.

3.1 Human-product interaction

Defining the human-product interaction (HPI) is another pivotal moment in the ViP process. This phase in the ViP process is about finding the proper interaction that leads to the desired goal. The HPI forms a link between the future context and the to be designed product. Therefore, the human-product interaction has a dual nature. On one side it focusses on the user's needs, desires and concerns. On the other side the HPI focusses on defining the product qualities. An important aspect of defining the HPI is that it is done without a product category in mind. ViP considers the product purely a means to reach the desired goal defined in the statement. Immediately thinking in product solutions without defining the HPI only leads an artificial product-solution fittings, since assumptions are made on the HPI level.

There are a couple of ways in which the HPI can be defined. There is no good or bad way, just like there is not a good and bad HPI. Only, some HPI's will describe better what you want to achieve then others. Think about words, images, drawings etc. Personally, I prefer the analogy method. It allows me to adopt a refreshing perspective from another domain. This helps me to discover unexpected insights in the mobility domain. Additionally, an analogy motivates me to pay attention to the (emotional) details of the interaction in a certain context. It helps me to create an HPI that has enough direction while leaving room for personal interpretation.

3.2 Analogy

By exploring several analogies, like initiating a referendum, De Voedselbank, the collaboration between professors and PHD'ers the following key requirements were identified that define an appropriate analogy within this project:

- Should have a low participation threshold
- There should be a self – interest component
- One or several stakeholders are more dominant

These requirements are important as they are important aspects that exist in the future context. The analogy, discussed in the following paragraphs, is one that fulfills these requirements and describes an appropriate HPI for this design project.

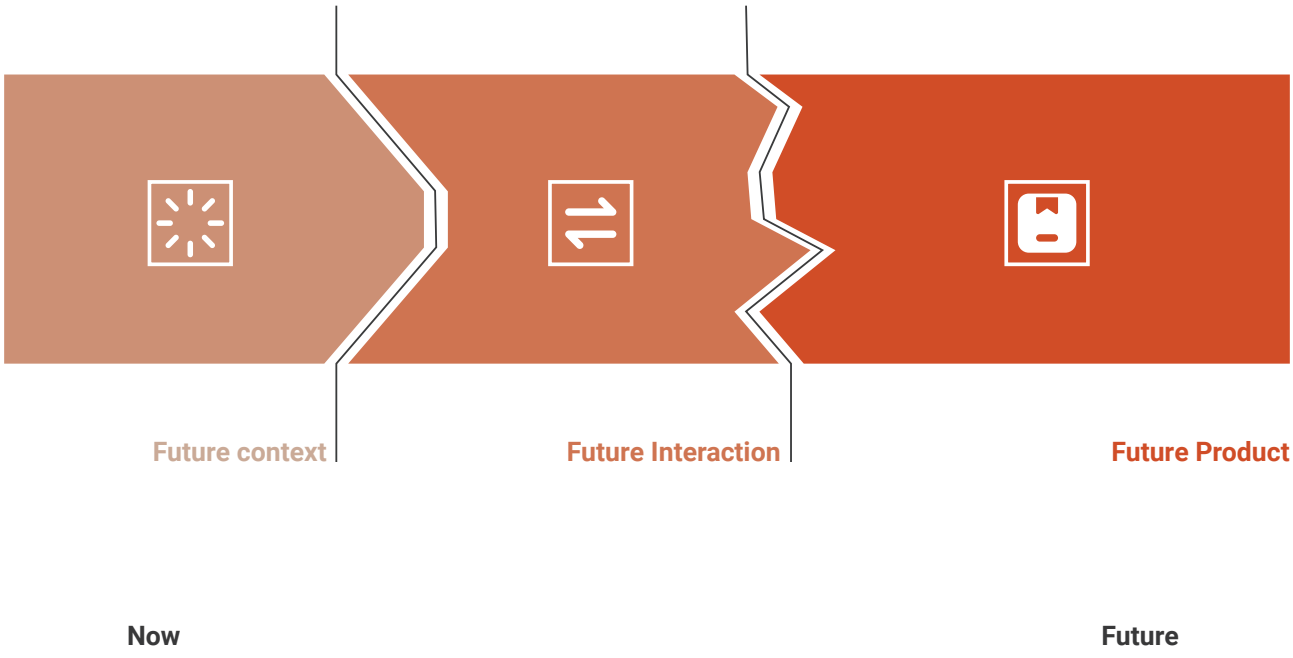


Figure 25 A schematic representation of a future interaction coupling the future context with the future product. Defining a product category without first defining the future interaction can lead to a mismatch or a sub-optimal solution for the future context and the pre-defined goal.

Figure 26 Migratory birds take flight from a threshed field in Southern Idaho. The interaction between a single bird and the flock representing the envisioned interaction vision from which product qualities followed.

Flocking analogy

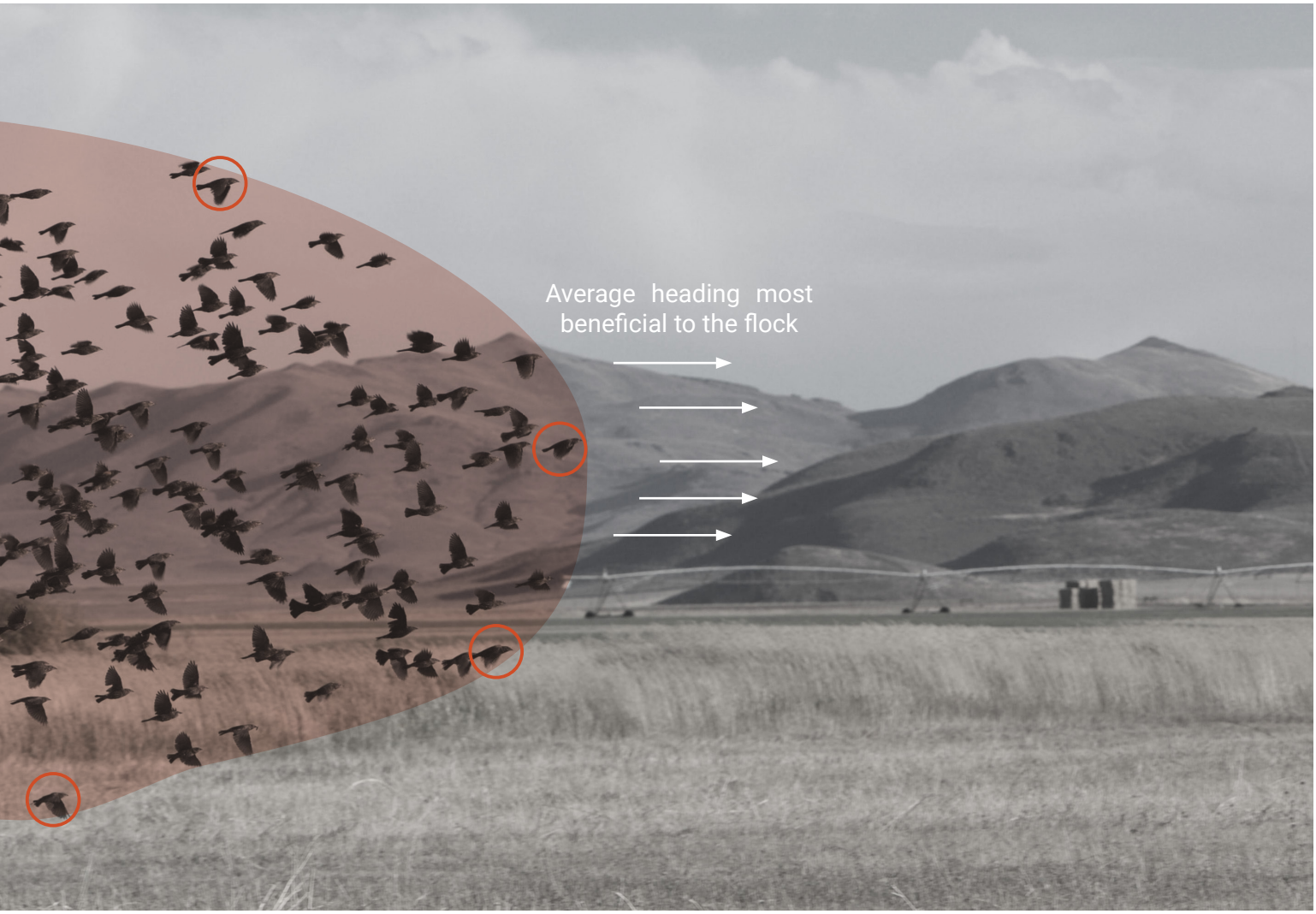
Drafting is an aerodynamic technique where two or more objects are closely aligned at high speed to experience overall drag reduction. With this, energy consumption will be reduced for all. There are various forms of drafting. Best known example is the V Formation birds fly in. Flocks of birds fly in a V formation to reduce overall drag up to 71% (Lissaman & Shollenberger, 1970). This helps to extend the range of the flock of birds and enables weaker birds (majority) to travel with the flock. The birds flying at the tips and at the front (front runners) rotate in a well-timed cyclical fashion to spread fatigue among those who are strong enough. These birds have the most influence on the average heading of the flock. This direction or destination is always most beneficial for the flock as whole. In this analogy, the frontrunners represent the people with mobility surplus. They are the ones who are able to use their “strength” to create more favorable conditions for the majority to reach the same goal.

Birds who decide not to fly with the flock are called outliers. These birds do not follow the rules the majority does follow that results in the complex behavior that the flock demonstrates (Reynolds, 1987). There are three rules that define that behvior: 1 - Separation - avoid crowding neighbors (short range repulsion), 2 - Alignment - steer towards average heading of neighbors, 3 - Cohesion - steer towards average position of neighbors (long range attraction). Not satisfying to these rules lead to increased individual dangers (predators), increased wind air resistance and less efficiency. Thus, not following these rules lowers the chances of a flock reaching the desired destination, makes it almost impossible for the individual bird to reach the same destination.

The flocking analogy, in particular the interaction that a single bird has with the entire flock, illustrates the interaction that I envision between the users and the to be designed solution that reduces socio-economic inequality. From this particular interaction product qualities emerge.

3.3 Product qualities

Realizing the envisioned interaction can be achieved by defining certain qualitative characteristics that the to be designed product needs to have. The ViP method calls these ‘product qualities’. These carefully picked product



qualities will ensure that the product will be experienced or used as defined by the future interaction in the future context to reach the desired goal. I have used the Design for Happiness Deck and brainstormed to come up with appropriate product qualities. The product qualities derived from my analogy that should lead to a successful realization of my future interaction are:

- **Caring**

Strong users should display kindness and concern for other users.

- **Structured**

The product should function according to the defined plan.

- **Belonging**

All users should have the desire to be part of a group. This can be achieved through activities that build or strengthen friendships, support intimate contact with people who we care about, or increase our sense of community.

- **Unity**

All users should feel the desire to maintain an overall sense of coherence with the product. This is achieved through activities that provides a sense of connectedness, harmony, or oneness with people, nature, or a greater power.

- **Prudence**

All users should have the ability to choose their own actions and words with caution, showing self-control over impulses for these long-term goals. They do not take undue risks or do things that they may regret later; they make decisions with careful consideration of the consequences for themselves and others.

- **Equity**

The product should treat each user equally. Equity is achieved through product features that enable users to promote justice, fairness and the unbiased treatment of all users.

- **Necessity**

All users should experience the existence of the product as a requirement for an efficiently and well functioning society.

These product qualities have been transformed into product features of a product (– service system) that exists in the future context, the Netherlands 2035. The next chapter will delve deeper into this future product as a manifestation of future mobility.

5.0 Concept

Designing a meaningful product (- service system) that enables, facilitates and improves personal mobility in the Netherlands by 2035 is, besides creating the vision statement, another important goal of this design project. Guided by the earlier defined vision statement, this chapter will illustrate how such a product (-service system) will look like and function, based on selected product qualities.

As mentioned at the beginning of this thesis, mobility is a complex subject, due to its multiplicity and the many forms and characteristics it can have. A way to describe these characteristics is through the use of three aspects of mobility. Namely; movement (geographical displacement), meaning (what does this displacement mean to people) and practice (how do we move). The enduring relations and structures between those three aspects of movement are called 'Constellations of mobility', reflecting society's norms and values. (Cresswell, 2013). The following paragraphs are analyze current mobility constellations. After that, a concept is presented for a mobility system. This concept also entails the future mobility constellation, as it alters the future relationship between the three aspects of a mobility constellation.

5.1 Current mobility constellation

Movement & Meaning

Currently, short-term mobility is mainly used by the Dutch for commuting (economic) or leisure (socio) reasons (Centraal Bureau voor de Statistiek, 2018). This is because the city, or socio-economic epicenter where many people live in or close to, do not offer the socio-economic opportunities that the inhabitants need. On average, Dutch people are travel up to 27,25 km on a daily basis to satisfying their socio-economic needs or that from others (Centraal Bureau voor de Statistiek, 2018). These patterns become apparent when the economy is doing well. When this is the case, there is more traffic, leading to more congestion. More people will make use of public of public transport leading to crowded busses and trains (Lieshout, 2018). Today, most of these problems, or increased mobility needs, are solved by focusing on providing more, roads, cars, trains and so on (Stravens, 2017). This comes from the old idea of focusing on extrinsic values, or in other words; the provisioning of goods.. When doing this, organizations mostly focus on the most congested places or with the best cost-benefit ratio. Most often that is in or close to urban areas. By trying to make them more accessible, through reducing congestion, people who are not living in or close to an urban area being relatively more limited in their access to the general mobility network. Resources used for providing mobility outside urban area's are more often used to reduce congestion in urban

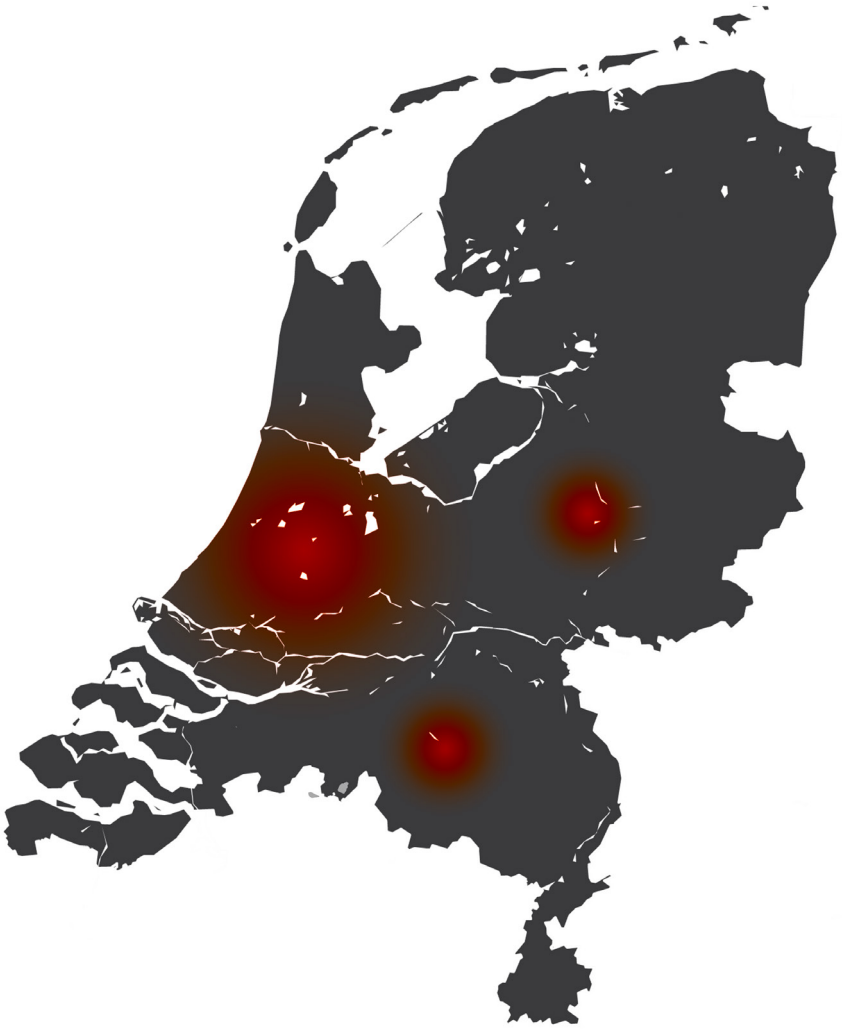


Figure 27 Most newly offered mobility services (bike or car sharing) concentrates around urban areas (orange color). This visual is based on information of ritjeweg.com and the websites of Mobike, Felyx, Car2Go, Keobike, Gobike, Geobike, Flickbike and Donkey bike.

areas because it is more profitable(Martens, 2011). Eventually, these places will be less valuable and be called “not-spots” due to their inaccessibility compared to more accessible areas (Platform 31& ZB Planbureau, 2017). This is not only a problem for people not living in urban areas. People who do live in city have increasingly more difficulties getting to these places without a car that are located outside these urban areas.

Practice

New organizations (mobility providers) have emerged that claim they can turn the tide. Organization like Uber, AirBnB, Lime and Blabla car claim they can solve these problems through sharing services trying to make mobility cheaper and so more accessible for more people. While they did have an enormous impact on how we move, they have not made mobility more accessible. Moreover, services like these even accentuate the socio-economic differences between urban area’s and non-urban areas. Their services are often designed in such way that they are the most beneficial and profitable in urban areas. This increases segregation within a society between the urban area’s and non-urban area’s. This is a problem which becomes more severe in the future since these kinds of services start to compete more and more with public services. Services which are already hardly available in non-urban areas and cause them to disappear even faster. It is an unfair competition between high class highly personalized mobility solution, allowing for hypermobilisation, and the lower-class mass mobility solution. This phenomenon demonstrates well the implications the of mobility conflict (chapter 2.5), that PwC find most interesting, has on current society. These problems will increase when an appropriate solution that addresses these problems is not implemented in the near future. Therefore, it is also not strange that these kinds of services do not possess all six selected product qualities that are essential for a product to be meaningful in the future context. On the long run, the difference between a group of people being hypermobile (having more socio-economic opportunities) and the group of people not being that mobile (having less socio-economic opportunities) have all kinds of negative consequences for society as described in chapter 3.2.

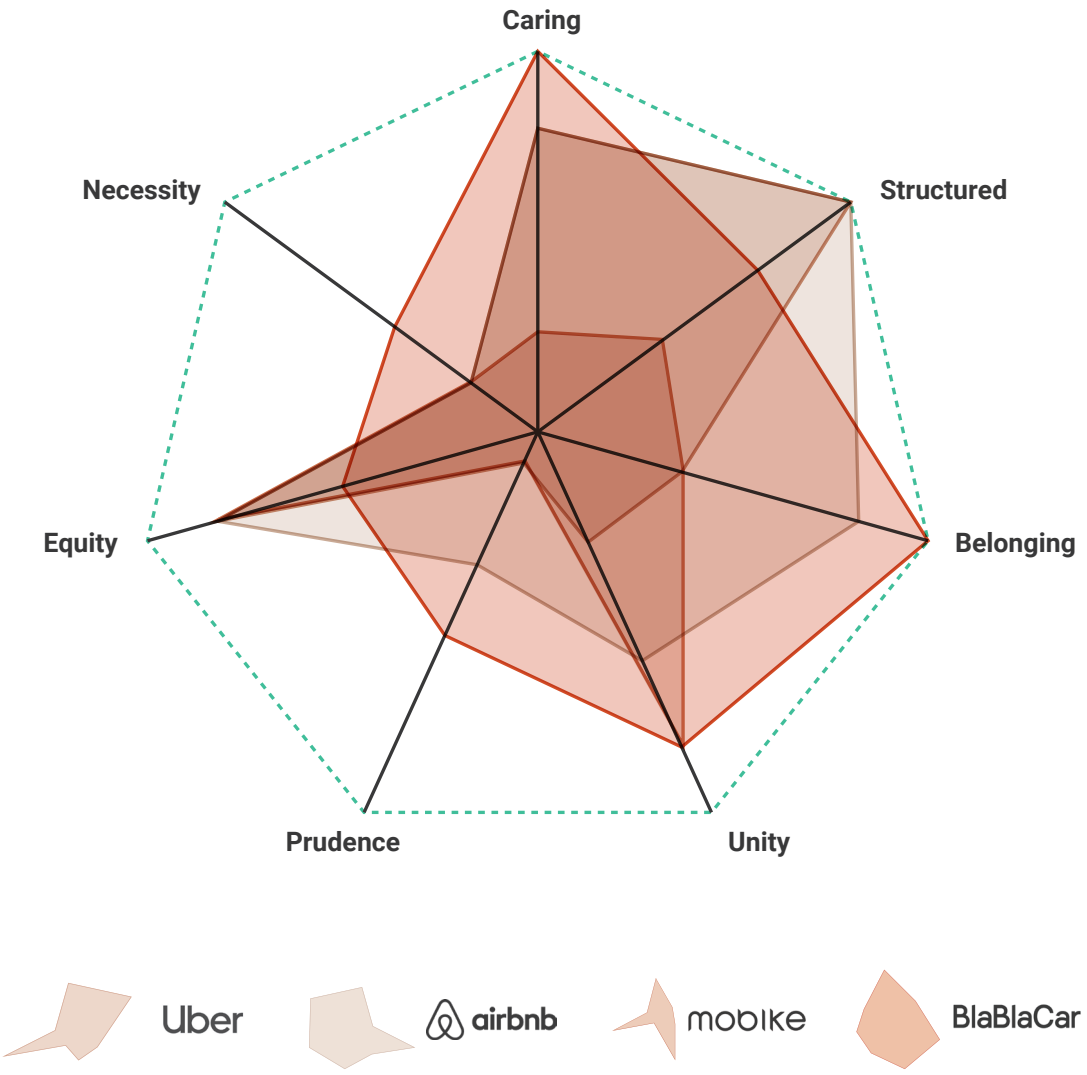


Figure 28 This is a radar chart of four mobility services and their performance according my earlier defined product qualities. The chart has been created based on my personal experience and information that I found on the websites of those services. My concept should take all product qualties into account.

5.2 Flock - A concept for a future mobility system

In this section, the final concept 'Flock' is presented. Flock is a concept of a mobility system in which travel costs are based on origin and destination zone which embodies the vision statement. Flock is my proposal for a meaningful form of mobility in the Netherlands by 2035. Individual features and elements (marked with orange) will be discussed after the summary of the system.

Summary concept

I envision a future in which the socio-economic value of an geographical area is no longer solely bound to static infrastructure of goods and services. In this future, socio-economic value of an area is mobilized by allowing it to geographically and virtually move anytime anywhere. This movement will resemble what people truly value at that moment. Being the client, PwC will develop or lead the development of the system which will be used by the government (**client)** to reduce socio-economic inequality.

Decoupling of current socio-economic areas and their geographical location is the first step to achieving the goal of reducing socio-economic inequality. This makes it possible to make weak socio-economic areas (low order) more accessible destinations in terms of travel costs, compared to stronger socio-economic areas (high order). I call these mobilized socio-economic areas: **mobility epicenters (ME's)**. A group of ME's of the same size and order that compete with each other for the attention of people is called a **mobility flock (MF)**. These flocks exists on national and regional scale. All ME's and MF's and have a score based the presence on people, the movement of people and the socio-economic value of available services. A high score (high order) means there is a lot socio-economic value. A Low score means the opposite. The ME's and MF's are updated daily. Lastly, **road pricing** is used as a means to move socio-economic value to the weaker areas (low score). For example, traveling with a non-public transport vehicle (public transport is excluded) from a high order location to a lower score destination results in cheaper road pricing. From a low order location to a higher order location is more expensive. The amount of charged road pricing depends on travel origin and destination. Not distance or moment of traveling. This means that traveling by car away from the ME of Amsterdam towards Klundert, a small ME village, is cheaper than traveling towards Amsterdam. My hypothesis is that, after many cycles (months or years), this leads to improved sustainable equity among the Dutch. Because people, goods and services will be motivated to spread and locate themselves further away from crowded areas with a lot of value and activity.

People are able to virtualize any vehicle that provides mobility. This is called **mobility virtualization**. Mobility virtualization is the act of personally participating in a nation-wide de-centralized mobility network by investing in it with a privately-owned product that is capable of providing mobility. If done successfully, access will be granted to similar modalities that provide the same amount of mobility. This could be within the same MF as where the owned mobility asset is located but also in another MF. Money is earned when the vehicle is used by someone else.

Users are able to interact with this system through an **app** which is called Flock. This app provides users information about the socio-economic value of location. Also, this interface allows users to calculate road pricing estimations and manage their virtualised mobility assets.

The following sections will go more into detail of this concept.

Government as client and citizen as user

The client of Flock is the one who should make use of this mobility system to reduce future social-economic equality, which is the Dutch government. It most logical for the Dutch government to make use of such system, as social-economic inequality has and negative impact on society. On top of that, the Dutch government is required by law to make sure that the following process takes place in an orderly manner (De Nederlandse Grondwet, 2019): The stimulation of employment opportunities, social security for the population and spread of prosperity. Besides that, the Dutch government is also responsible for employer well-being, social security, stimulation of public health, the stimulation of social and cultural development and for leisure activities. This mobility systems allows the government to take that responsibility. All people within the Dutch borders are the users.

Not the whole government is involved in practice. Within the government different ministries have different tasks and responsibilities. The Ministry of Social Affairs and Employment (SZW) and Ministry of Infrastructure and Water Management (I&W) are expected to be the most relevant ministries to be using the system. The mission of the SZW is *"Work and social security for everyone: working together for living together."* Their is: *"Honest, healthy and safe work in the Netherlands. Everyone must be given the opportunity to participate and to develop so that you can contribute to their own future. If things go wrong, we provide a safety net and if you retire an income. That is only possible in a country where people are there for each other"* (Rijksoverheid, 2019). This vision is completely in line with the goal of the vision statement of this project. The main goal of the I&W is to maintain Dutch infrastructure to ensure country that is livable, accessible and safe for everyone (Rijksoverheid, 2019). In other words, their main focus is maintaining Dutch mobility. Therefore, they are also a relevant ministry, as the proposed system uses mobility as a means to achieve socio-economic equality.

Mobility Epicenters (ME)

ME's are "centers of mass" of people and their

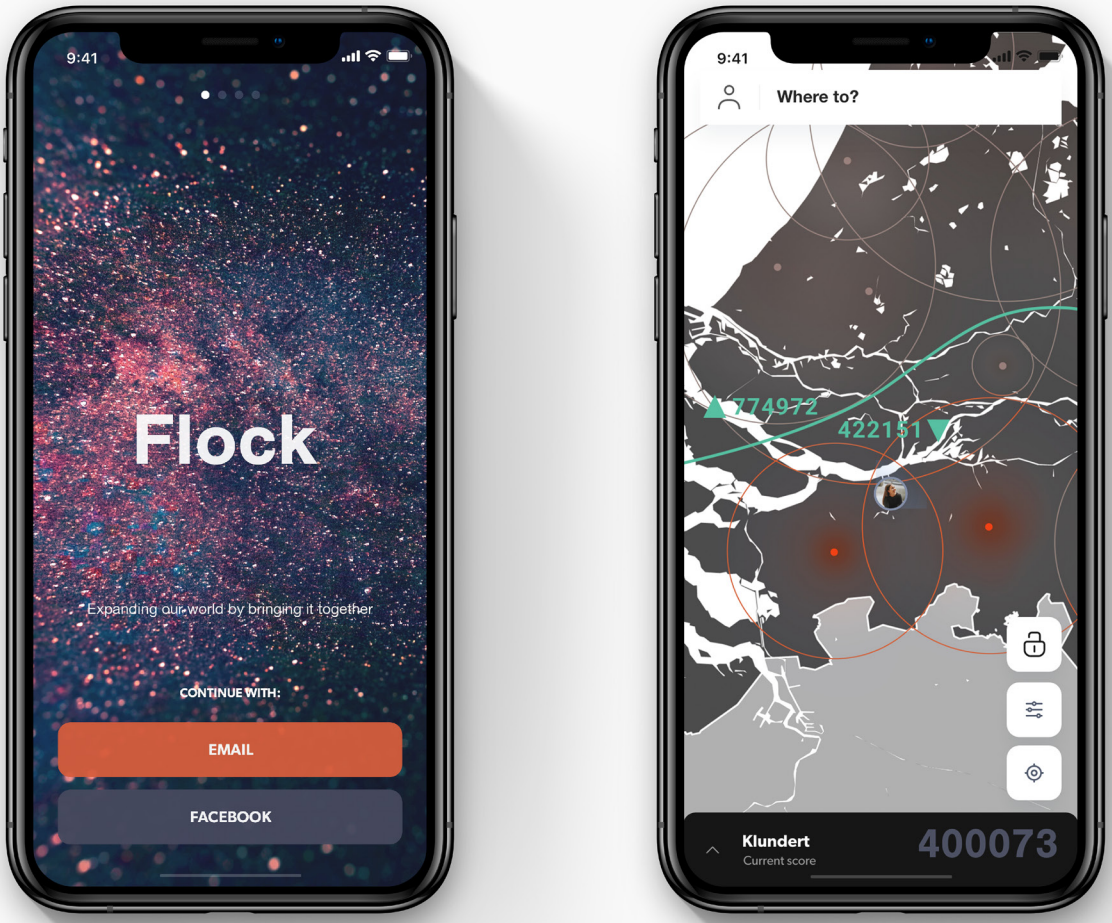


Figure 29 A visualization of the smart phone app which the user will be using to interaction with the Flock mobility system.

movements. These centers are based on the analysis of the daily movement of people, their origin and destination and the total number of people on one location. This analysis will be performed on municipality level since it will simplify the collection of data. On this level, a lot of this data is already collected and structured on this level. This approach is based on the central place theory created by Walter Christaller. See appendix E for more information about how I got to this approach, the limitations and the adjustments I made to overcome most of the limitations.

Daily movement of people
Daily movement of people will determine the center of the ME. This is achieved by looking at the origin and destination of the daily movement of people on municipality level. This will reveal the origin and destination centers that form the basis of the ME. The number of movements will result in a certain score for a center. More movement means a higher score. There is threshold of 500 movements for centers to exists. This number is adopted from the measuring method from Centraal Bureau voor de Statistiek (Olden, Steiner, & Bingen, 2017)

People center of mass
The "People gravitational model", based on newton's gravitational law, of Floor and Van Est (1983) is used to determine the sphere of influence and competing power of mobility epicenters on the neighboring ME's. In other words: it determines the range of a ME. The model is used to calculate the potential customers of a ME based on origin and destination of the people associated with this ME. This includes residents that live near or at the ME. This will be translated in to a certain score. More people, and so more influence leads to a higher score. Mobility epicenters are competing with each other when this sphere of influence overlaps and when it has approximately the same power.

Socio-economic value of servcies
Additional to people's center of mass a score is given based on the socio-economic value of present services. The value is based on the amount of facilities, the uniqueness of these services and how many people use these services. Services could be anything ranging from a school to a swimming pool. A full list, composed by CBS, can be find appendix F. Every service has a certain score depending on the socio-economic value of that particular service. Determining the socio-economic value of a services is important. It covers the complete definition of mobility which is: the intention to move and the realization of this movement in geographical space, thus implying a social change. As movement and the amount of people focusses on the realization part of this definition, socio-economic value of services in a certain area covers the intention part. To make it more concrete: a route of public of a public bus which is barely used, driving past a supermarket, schools, etc, still offers great mobility for an area and the few people living and working there. This can only be detected via determining the socio-economic value of an service.

I was not able to define this score through research. I therefore asked experts that I interviewed for advice about this. See chapter 6 for a more information about this part of the concept.

Mobility Flock (MF)
MF's are created on national and regional scale by grouping adjacent centers that compete with each other on score and size. This border defines significant difference in socio-economic value with one being high and one being low. Traveling from a MF with a high score to a low score is cheaper in terms of road pricing than vice versa.

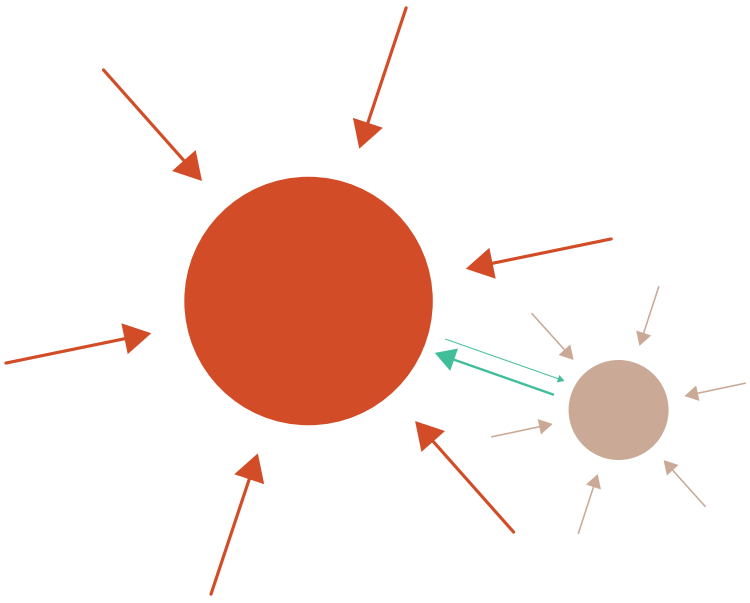


Figure 30 A visual representation of the people gravitational model. The two circles represent two mobility epicenters, the size of the circle the amount of people at the location and the arrows the "gravitational pull" on people. The bigger circle, the greater the gravitational pull is, just like newton's gravitational law describes. A greater gravitational pull leads to a higher socio-economic score for that area. Both centers also affect each other. The orange circle with more gravitational pull will pull people away from the smaller circle.

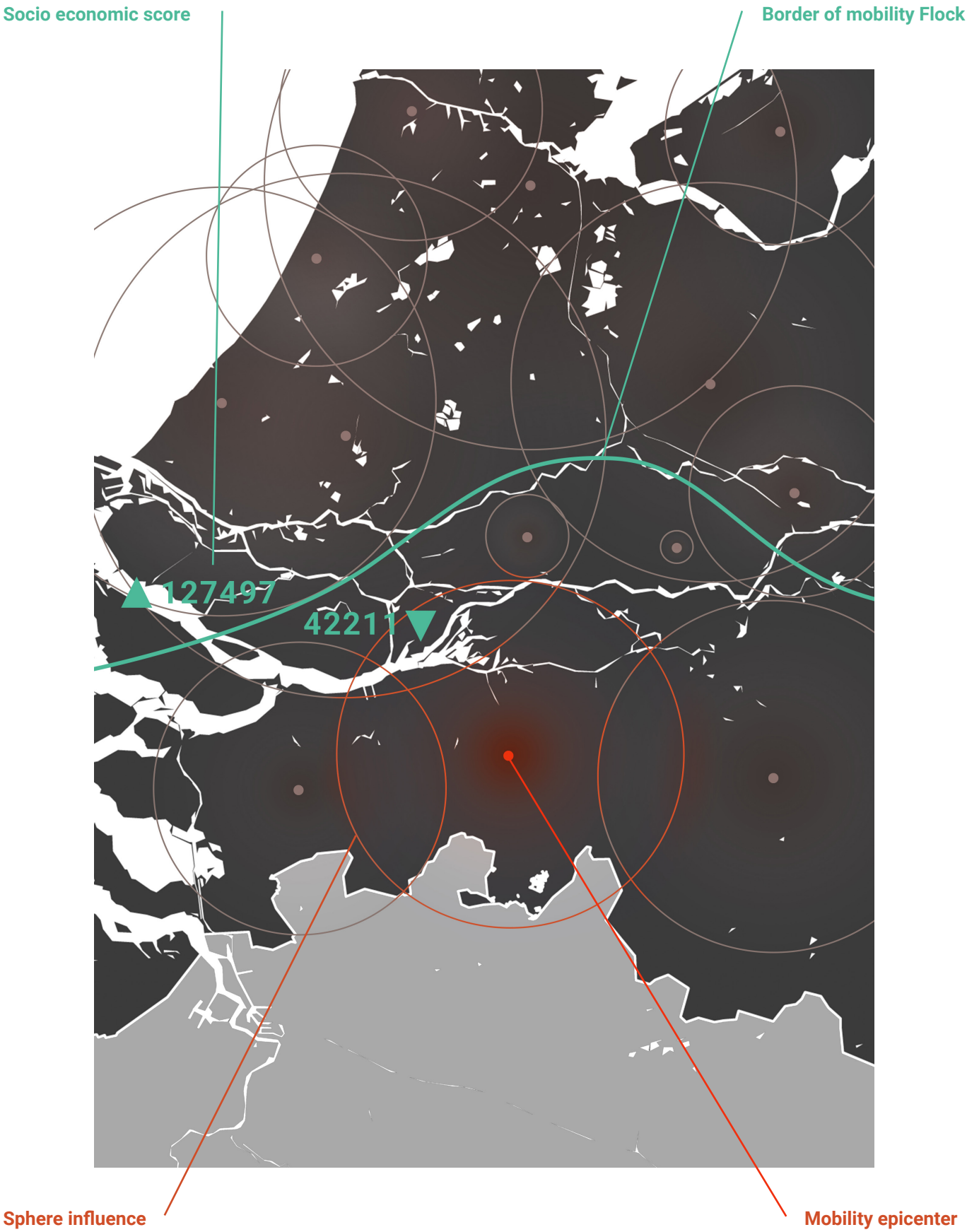


Figure 31 A visualization of the different aspects of the mobility system.

Road pricing

Road pricing is a financial charging mechanism used to change behavior of road users. It is a known fact in the field of traffic engineering that the individual road user only experiences the own disadvantage of a congested road network. It is one of the main causes of the suboptimal load on the road network (AsapSCIENCE, 2016). As TomTom said in one of its campaigns, *"You are not stuck in traffic, you are traffic"* (Reid, 2018). By means of a variable charge, road pricing tries to motivate road users in not only taking personal motives into account in his choices of making use of the road. Currently these variable charges are most times dependent on road tolls, distance or time-based fees, congestion charges and charges designed to discourage use of certain classes of vehicle, fuel sources or more polluting vehicles. (U.S Department of Transportation: Federal Highway Administration, 2019). Instead of using one of the above-mentioned variables I propose using the origin and destination as variable to determine fees. The height of the charged fee should be higher when travelling from a weak socio-economic to a stronger area. It should be lower when it is the opposite. Because of, this traffic flows are redirected to weak socio-economic area which will become more accessible in terms of travelling costs. On the long-term socio-economic value will shift to this weaker area's as it is less expensive to move to and move around in these areas. So, unlike conventional road pricing systems, this system does also not necessary focus on reducing congestion. In essence it redirects traffic flows to areas which were less accessible before.

Mobility virtualization

Another mechanism is needed to prevent people from traveling unnecessary far for their wished goods and services. If this system only increases mobility usages, more stress will be put on flora and fauna. Therefore, another crucial aspect of this system is mobility virtualization which makes sure the such system honors the creation of a better world for flora and fauna as defined in the vision statement.

Mobility virtualization is the act of participating in a nation-wide de-centralized mobility network by investing in it with a privately-owned product that is capable of providing mobility. If done successfully, the user will be granted access to modalities similar he or she privately invested in the system. This could be in the same geographical area as where the owned mobility asset is located or could be somewhere else. In the end the user will have less travel costs because he or she is not required to take vehicle from the origin to the destination. Instead, the user can choose to first make use of public transport (which is cheaper in terms of travel costs) and after that make use of someone's else vehicle on location. Hereby, the user is incentivized to not take their vehicle anywhere they go as it is more expensive and puts more weight on flora and fauna. On the other hand, the person providing the vehicle is incentivized to not use the vehicle all the time when alternatives are available. Still, it will enable people to enjoy and utilize the mobility they provide to others, which is embedded in product they own, free from location and time of the day. This is because they earn money when someone else uses their vehicle. Investing a privately-owned vehicle is not required when someone wishes to make use of this service. A one-time fee can be paid based on where the service is used and what the origin and destination was.

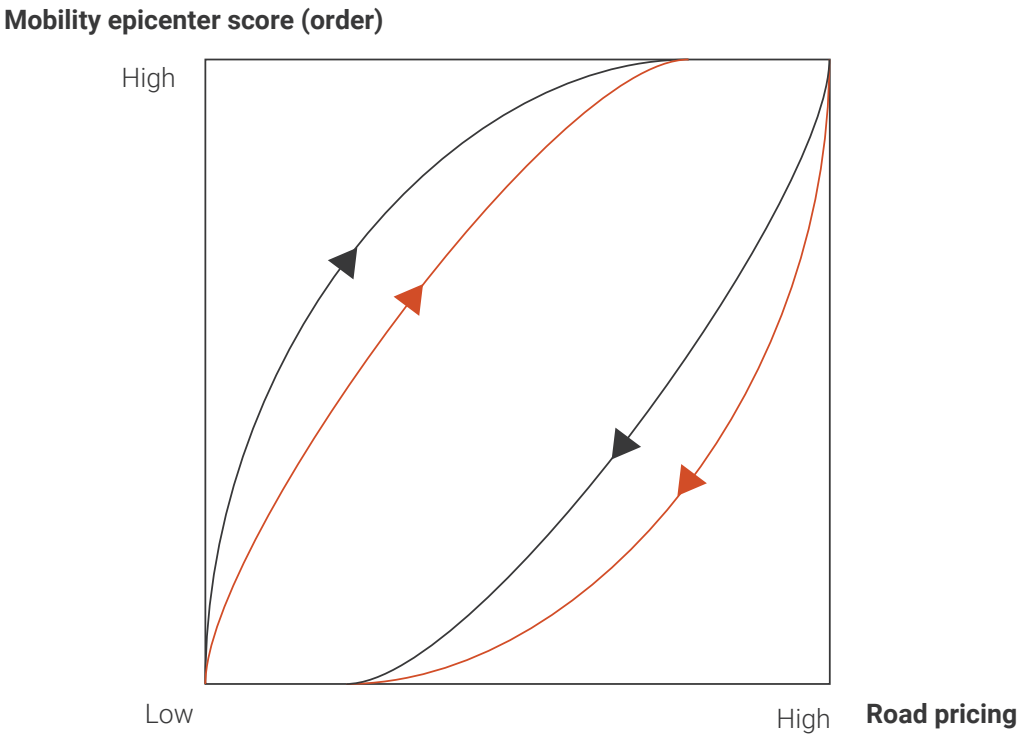


Figure 33 Road pricing curves. Visualized are the journeys to mobility epicenters from a low to high and vice versa. The **dark** journey's are the journeys in which a privately owned vehicle is used. People uses besides privately-owned vehicles also public transport to cover the largest part of the journey in the **orange** journeys. It is visible that those journeys are in the end cheaper. This is to incentivize people to use their mobility in such a way that it minimizes the load on the mobility system, ultimately leading to a less negative impact on flora and fauna.

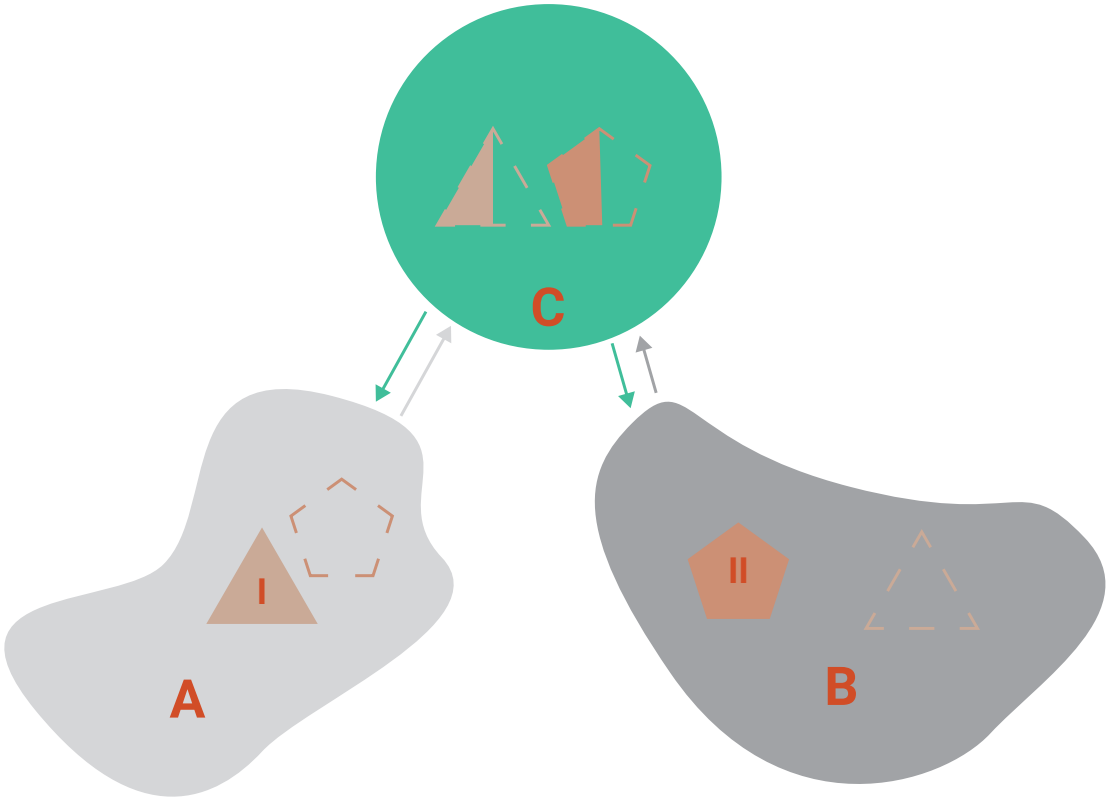


Figure 32 A visualization of the mobility virtualization sub-system. **A** and **B** are different mobility epicenters or mobility flocks. I and **II** are different privately-owned mobility assets. These assets are registered to the mobility network represented by **C**.

Smartphone app as system interface

The smartphone app, which is called Flock, functions as the interface for user to interact with the mobility system. It allows the user to have an overview of all mobility flocks, their scores and the forecast of the scores. Together with a built-in travel plan enables, users will be enabled to make well considered choices concerning their mobility. Also, the app will allow the user the make use of the mobility virtualization service. Managing their virtualized vehicles is also done via the app.

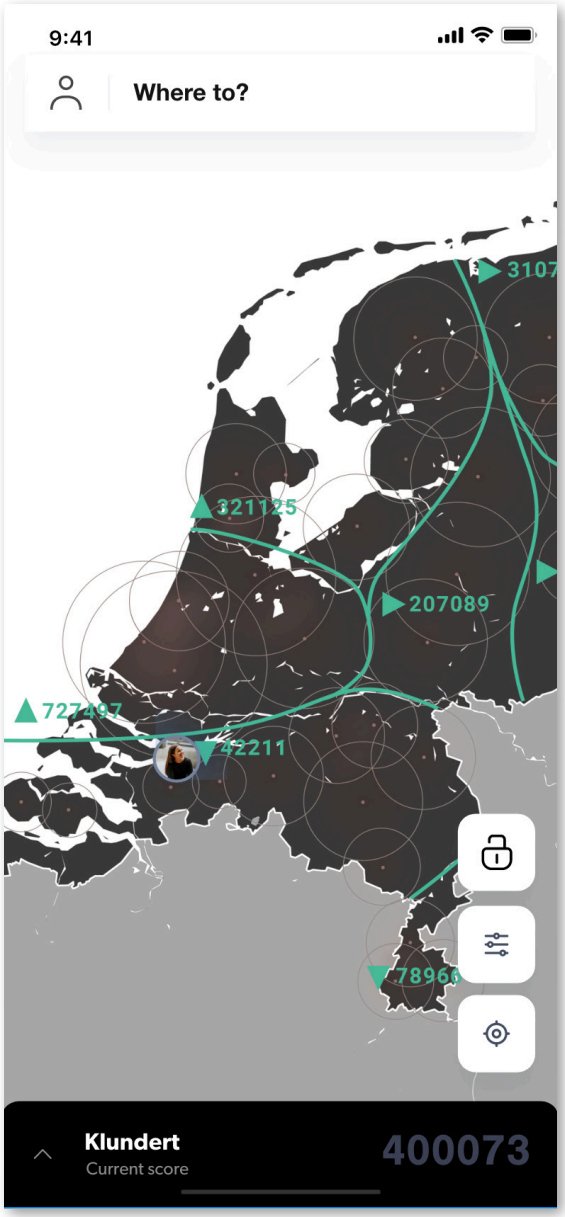


Figure 34 Overview screen. Mobility flocks are show with their scores. Also the current location is displayed with the corresponding score.

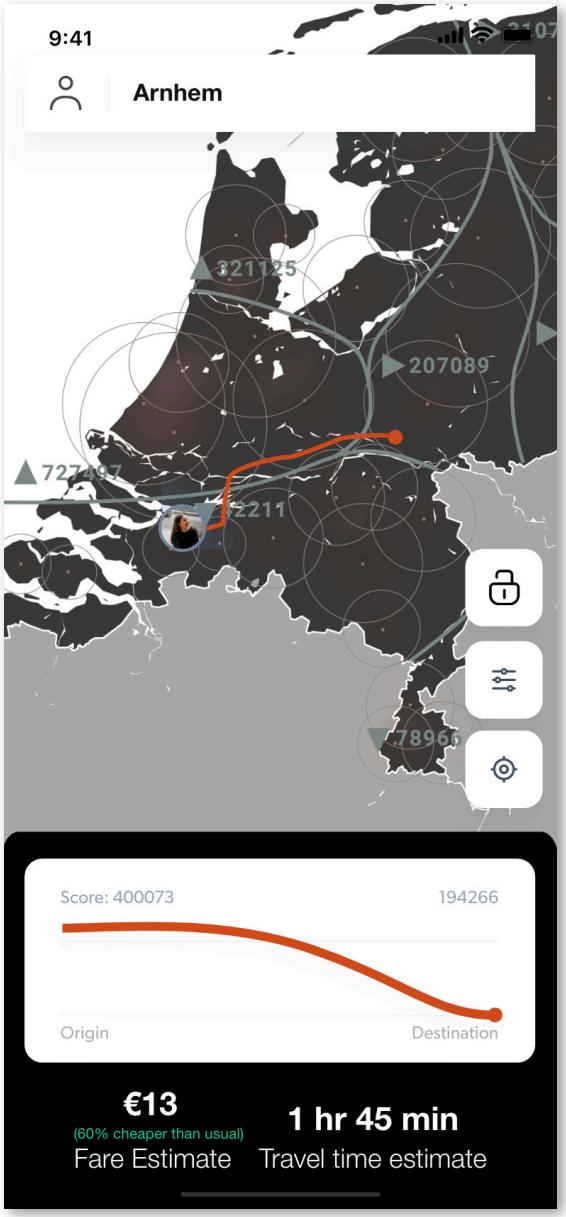


Figure 35 Route planner. A route has been planned. It shows the road pricing costs going down when getting closer to the destination.

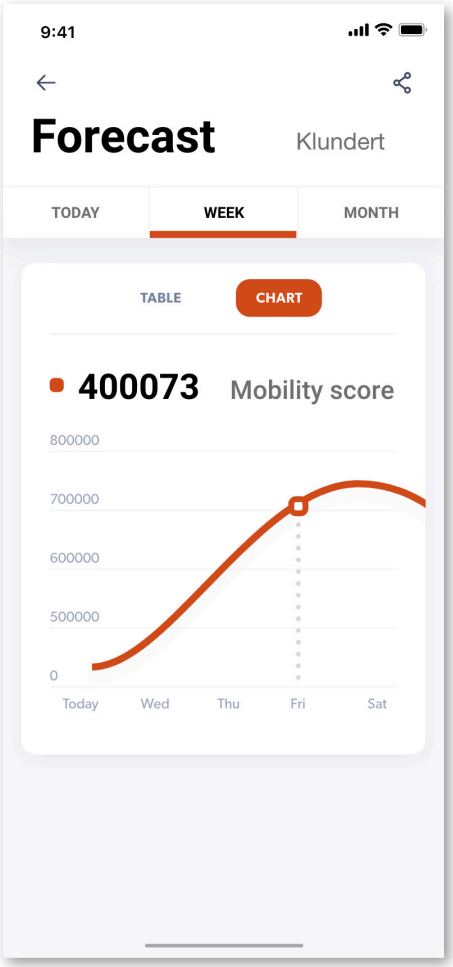


Figure 36 (Top left) Forecast screen. This screen shows the predicted mobility score for Klundert. This enables the user to plan and make well informed decisions regarding it mobility.

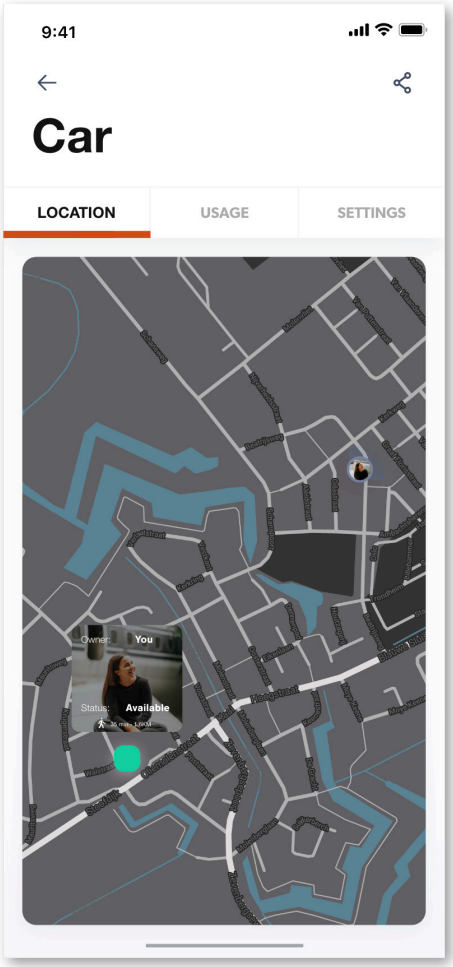


Figure 37 Car screen. It shows the current location of a privately-owned product which invested in the network. In this case it is the location of a car.

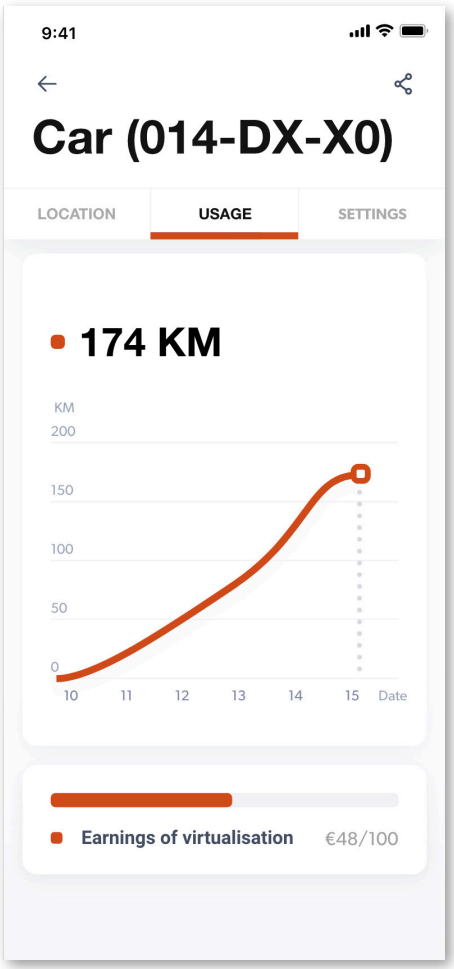


Figure 38 Car usage screen. Usage of the car and the amount of earnings can be monitored via this screen.

6.0 Validation

Validating a proposed design solution on viability, desirability and feasibility is at the heart of every design process. To keep the project manageable and within time I decided to validate the system by conducting qualitative interviews with experts. Later on insights gained from these interviews are used to come up with a final design.

6.1 Method

Qualitative interviews

To keep the project manageable and within time I decided to validate the system by conducting qualitative interviews with experts. It is an effective way of gathering valuable feedback on the core principles of the concept. This feedback can still be efficiently used to make alterations to these core principles of concept since the system is still in a conceptual phase. If resources were infinite, simulations could also be made to simulate system. Then, scenarios could be created and simulated to see if the results of these simulations match the desired outcome with an acceptable level of uncertainty. However, this will be a costly endeavor if after the first simulation is discovered that the system is based on faulty core principles that cannot lead to the desired result with a reasonable uncertainty factor. This risk can be taken away by first conducting expert interviews to test the feasibility, desirability and viability of the proposed system.

Interview set-up

A semi-structured interview is selected as interview from. In contrast to a fully structured interview, a semi-structured interview is open, allowing new ideas to be brought up during the interview as a result of what the interviewee says. Still, an interview framework with questions and themes was created to be able to guide every interview the same way. Every interview was conducted and recorded at the interviewee preferred location and lasted between 50 and 80 minutes. I also brought some visual material printed on A4 in addition to the prepared questions. The material contained a summary of the vision statement, analogy, concept and interface of the app. Interview framework and materials can be found in appendix G.

Interviewees
In total three interviews were conducted. These three people were interviewed because of their expertise in the field of mobility or subjects related to the created concept.

Rajendra Sitompoel
Currently, Rajendra is the head of Customer Centric Design at ABN AMRO Bank. Before thay he worked for 14 years at PwC. Before he became director of PwC digital services he mainly focused on valuation and pricing within the economics field. I decided to interview him because he can provide me with feedback on mechanism I thought of to determine socio-economic value of area. His feedback allows me to test the feasibility and viability of my concept, in particular that mechanism, and improve it afterwards.

Niharika Mahajan
She is TU Delft PhD candidate researching connected driving assistance and traffic management. With her background in traffic engineering (transport & planning), interviewing her would enable me to validate the idea of using mobility to reduce socio-economic inequality from a traffic managment point of view.

Ingeborg Oostlander-Çetin
As an advisor on mobility of the TU Delft management, interviewing Ingeborg woul enable me to test the concept desirability. She has background in mobility policy making for the TU Delft and for the Ministry of Transport and Water Management, the potential client in this project, where she worked for 10 years. I expect that she can provide me interesting feedback about my feedback. In particular I hope that she has some great feedback on the implementation aspects of my concept.

6.2 Results

Many insights were gained during the interviews. I grouped the insights gained from the interviews under different topics. I will discuss these topics in the following sections. The implications of these topics on my design will be elaborated on in the next chapter.

Zonal pricing method is viable and feasible

In general, the proposed system makes sense from traffic engineering perspective Niharika said in our mail conversation and interview. Adapting travelling behavior by zonal pricing mechanism in order to control flows between different origins and destinations is a mechanism that could work to reach your goal she said. Combining that with mobility virtualization enables you to control mobility from a supply and demand point of view. The same was confirmed by Rajendra and Ingeborg.

What is most interesting is that my mobility systems challenge the conventional notion of time value-based travelling which is often used when modeling traffic systems. This notion purely looks at the value of time from a cost-benefit perspective. This is an economist perspective which is rejected by the socially inclined professionals in the field of traffic management. My proposed model tries to satisfy the wishes of both parties according to Niharika, which is interesting. To her knowledge there does not exists a model which tried to do something similar. The closest model she knows of is an activity-based model which works with attraction centers. This model is however mostly economic focused. In this model a place like the Zuidas in Amsterdam has a lot of value because of its economic attraction power. This different to my model because I also look at the sociological value. This is quite low in this example because chances are low people decide to go to the Zuidas on their day off as leisure activity.

However, there was one aspect of the concepts where everyone had doubts. It was using road pricing or any form of taxation to redirect traffic flows. Everybody said that is was not great but not bad either. “A test is required to test if road pricing as you suggested leads to the desired result. If we assume that you have the socio-economic value of service” Ingeborg said. Niharika suggested other forms of pricing that could lead to the desired result. One was variable parking prices. Another pricing form worked via charging a certain fee when entering a zone. The latter seems more desirable as it create a less intense political discussion (see next paragraph). Also, compared with a model in which variable parking prices are used to determine fee, using the zonal entry fee modal is a less segregated approach. A less segregated approach increases, especially in the beginning when computer power has it limits, system feasibility, desirability and viability because system complexity is reduced and socio-economic value is determined over a larger area with multiple people instead per individual case. This makes political discussions (see next paragraph) easier as political parties already indirectly represent groups of people in instead of individuals. This political parties to better defend the interests of these groups of people.

Determination of socio-economic value

During the interviews I found out that there is, just like many design decisions, not one way of correctly determining the socio-economic value of an area. However, I did go some good feedback on my initial idea on which pointed me in the right direction. “To start with, socio-economic value for who and what exactly?” I got this question from Rajendra during the interview. Value is different notion for everybody. While someone values sitting on the couch and watching Netflix all day, someone else values climbing mountains. So, deciding socio-economic value for who is the first step in being able to come up with a mechanism that is able to determine it. The answer to this question is; the socio-economic value for society of the presence of services in a specific area. That is the value I want to quantify as the goal of this project is to reduce future socio-economic inequality among the whole Dutch population.

Normally there are two ways of solving a valuation question like this Rajendra said. A conjoint analysis can be performed or another analysis can be carried out in which a known socio-economic value of a service can be extrapolated up – and downwards to discover other values of the other services. However, the problem with the conjoint analysis is that it is normally performed on an individual level with a limited number of variables. It will be very resource intensive and almost impossible to let all Dutch citizen perform a conjoint analysis and combine the outcomes of these analyses to into one definition which defines what is value for society. The problem with the other method is that there is currently not a known socio-economic value which can be used to extrapolate.

Besides these challenges there is one more challenge that is even more important, mentioned by all interviewees and which I did not realized earlier in the design process. Namely, deciding which factors to take into consideration and which not is a normative action and process. In essence you need to decide which factors and outcome are good, desirable or permissible and which are bad, undesirable or impermissible. This is in the basis a political process from which the outcome highly depends of what the society wishes to achieve. For example, having a considerable amount of sport facilities of excellent is of more socio-economic value in comparison with institutions researching the mysteries of the depths of the ocean if the society wishes to have successful sportsman and woman winning Olympic medals. This decision process is a long political process which require many debates, discussions and more research to determine what society values most and which combination of services is able to provide it the best.

Roadmap implementation

One of the asked questions was about the realization and implementation of this concept. I asked all interviews what steps they would undertake to realize this concept. Everybody answered that they would focus first on getting a socio-economic valuation system right. This will take some time since a lot of politics is involved in this normative task. Additionally, everybody answered that they will solely focus on making static socio-economic valuation a reality. “Realizing a static valuation is already difficult enough to begin with. Doing this dynamically on almost real-time speed is something for the far future” This is the feedback I got from Rajendra.

Ingeborg had a couple of suggestions from a policy point of view about realizing this concept. She suggested to start with using this model to modernize the concession model used in planning Dutch public transport. The concession model is a package of transport services which are, under certain conditions, are exclusively granted to transport providers by the government. Rights and obligations are linked to these packages. In some cases, transport providers need to pay the government to be allowed to offer their services. In other cases, they are being paid by the government to offer their services in certain areas. The latter mainly occurs if it is an area which is financial costly to provide mobility service because there is only a small number of people making use of the service. Paying transport providers incentivizes transport providers to deliver their service their as well. It keeps the area accessible. It is clear that currently this model is mostly focused on economic viability, the cost-benefit ratio of mobility, rather than sociological necessity for the people. This model could be a way of integrating the sociologic perspective of mobility in this concession model for providing public transport. Even more interesting is to use this model to create, manage and distribute licenses for companies that want to deliver a mobility service in a certain area. For example, a mobility service, like an on-demand taxi service, can be required to deliver their service in socio-economic weak areas if they also want to offer their services in the inner center. This could be the way to regulate these new mobility service and at the same time making sure that these services are accessible for everyone.

7.0 Final Design

Validating the concept with experts led to numerous insights and ideas that can be used to improve the concept. This chapter presents the final design of the mobility Flock systems. A design roadmap has been created to provide an overview of the final design over time. It shows which steps need to be taken to realize this final design.

8.1 Summary final design

A meaningful form of mobility in the Netherlands in 2035, is a structured mobility system called Flock. Flock cares about the equal creation of prosperity on the short- and long-term for everybody rather than only serving those who are already enjoying enough socio-economic opportunities to fully develop themselves and people they care about. There are three phases in which Flock evolves over time which enables Flock to release its true potential.

Phase 1

In phase one Flock enables governmental bodies to create a sense of belonging and unity among all organizations that provide a degree of mobility. This is achieved by modernizing the concession model. The model is used to ensure a minimum coverage of public transport and to prevent organizations from acting primarily from self-interest. Instead, providers of mobilty, such as ride sharing companies or bike sharing companies, are forced to provide their services in such way that it benefits most people. Flock achieves this with introducing a sociological component, the societal value of service being present in an area, to this mainly economicly focused cost-benefit process. This makes this model a suitable tool for granting mobility licenses for conventional services (Taxi's) as well new services (Free flowing bike sharing services) as it concretises the social necessity of areas having access to a certain amount and quality of mobility. To give a concrete example, from an economic point of view a barely used bus connection in Flevoland may not seem not interesting. However, the few people who are using this bus connection are researcher from Wageningen University researching a new kind of natural exterminator which more effectively deals with the oak processionary. This is from great societal value for the Netherlands. The modernized concession model aids in unraveling the mobility patterns that have such hidden societal value and supports these patterns. The Budget Memorandum, presented yearly on the third Tuesday of September, will be used besides the movement of people and the gravitational force of a group of people, as reference tool to yearly revise what society values the most. It is a first indication of the socio-economic societal value of an area based on the presence of a particular service.

Phase 2

Road pricing, for all vehicles based on origin and destination zone are introduced in phase two. Learnings gained from phase one are used to have a good start when introducing this phase to the public, all Dutch citizens. A website and smartphone application makes it possible for citizens to check the road pricing per zone. A desktop application for the government allows them to manage the zonal road pricing. The same application gives road pricing recommendations based on data provided by an updated API. By working with a zonal pricing user segregation is minimized to a zonal level. This is also the first phase in which more variables are factored in to determine the socio-economic value of an area based on the presence of service for society. Renewing this definition will also happen more often. Up to four times per year instead of one. This is possible because political discussions, political awareness and more research makes it possible to start automating parts of this process, making it less resource intensive and more manageable to increase the definition renewing frequency.

Phase 3

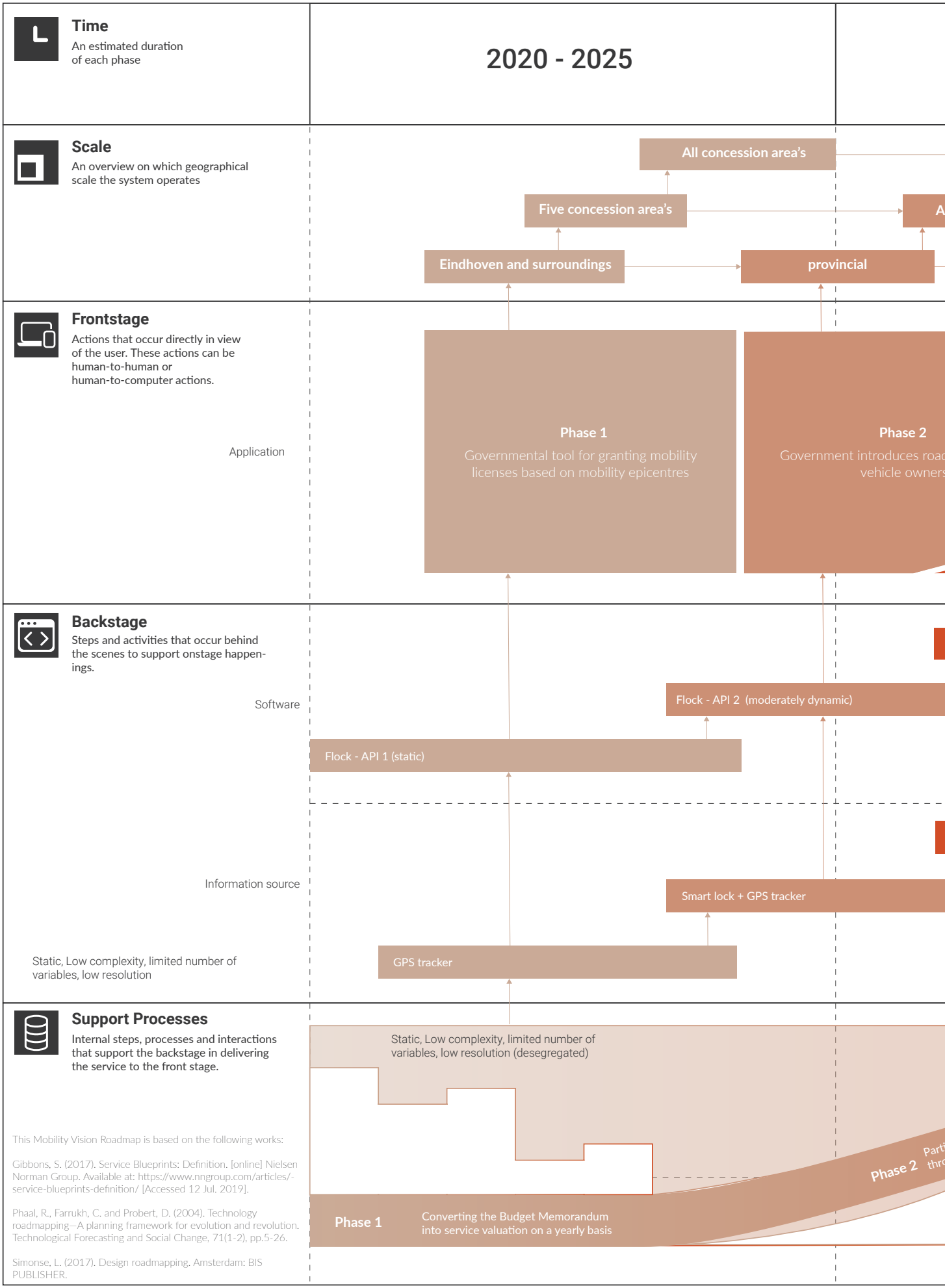
In the last phase, mobility virtualization will be gradually introduced to the public together with an updated application for both the government and user. Mobility virtualization makes it possible to safely use a privately-owned vehicle from someone else when this person does not require it. It allows the owner to utilize their mobility surplus and offers the user additional mobility. The person from which a privately-owned vehicle is used by someone else is paid for it. Besides increasing mobility, mobility virtualization could potentially reduce congestion because it stimulates using a vehicle close to the wished destination instead of brining a vehicle all the way to the destination. When it comes to determining the value of an area, this phase gradually transitions from periodical renewing analysis on zonal level to a near real-time refreshing analysis frequency on coordination level. This means that it is possible to determine the value of any given location on any given moment. To make this happen, a lot of different variables are needed. As these kinds of calculations transcend the human imagination, artificial intelligence will be used to make it happen. Datasets from the past years are used to train the AI over a long time period to make sure that the AI algorithm has a "feeling" of the societal sentiment from the past years and matches the expected outcome with acceptable uncertainty. By making use of an AI based system with near infinite resolution a more segregate system is created which will be more effective.

The following sections will elaborate on all details of this concept.

8.2 Design roadmap

The final design of the system is embodied in a mobility vision roadmap. (page 66 & 67). This roadmap is a high-level concrete tactical plan that needs to be executed to turn the vision into a reality. The structure of the roadmap is based on the Design Roadmapping theory (Simonse, 2017), Service-Blueprint design method (Gibbons, 2017) and Technology roadmapping method (Phaal, Farrukh and Probert, 2004. I used Design Roadmapping for establishing a general structure, Service-Blueprint to visualize the different user cases (intermediate phases) in relation to each other in time and Technology roadmapping to show how these user cases are made possible. Following paragraphs will elaborate on specific elements found in the roadmap that require additional explanation.

Future of Mobility: Flock - mobility system



This Mobility Vision Roadmap is based on the following works:

Gibbons, S. (2017). Service Blueprints: Definition. [online] Nielsen Norman Group. Available at: https://www.nngroup.com/articles/service-blueprints-definition/ [Accessed 12 Jul. 2019].

Phaal, R., Farrukh, C. and Probert, D. (2004). Technology roadmapping—A planning framework for evolution and revolution. Technological Forecasting and Social Change, 71(1-2), pp.5-26.

Simonse, L. (2017). Design roadmapping. Amsterdam: BIS PUBLISHER.


2025-2030
2030-2035
Municipality
ll concession area's
Hexagon (radius 30 km)
Infinite small resolution
d pricing for all
Phase 3
Citizen tool to virtualize their mobility and to see the different road prices in the different zones
Flock - API 3 (Highly dynamic)
Smart lock + GPS tracker
ally autmation of converting the budget memorandum
ough machine lerning and adding new variables
Phase 3
Big data scraping to include countless variables of every location on a near real-time basis
Highly dyanmic, high complexity, near infinite number of variables, high resolution (Segregated)

Support process

The support processes describes the internal steps, processes and interactions that support the backstage in delivering the service to the front stage. The government itself or partners that the government selects can provide these services (and also backstage and frontstage services). Within this mobility system this process is mostly occupied with providing data to the backstage (API) which is used to determine the socio-economic societal value of an area based on the presence of service. Phase one uses the Budget Memorandum. Phase 2 is a transition period in which parts of the data collection are automatized and new dynamic variables are added. Phase 3 makes use of a fully automated data crawler.

Phase 1: Budget Memorandum

The Budget Memorandum, short for 'Memorandum on the State's finances', is an explanation by the Dutch Government of the current and expected revenues and expenses of the Dutch National budget. Additionally it describes the prospective developments in the Netherlands, in Europe and beyond (Tweede Kamer: Der staten-Generaal, 2019). More importantly, the Budget Memorandum also reveals the Cabinet's priorities for that year. Details found in the separate budget bills of the ministries describe this. The Education budget, for example, lays down how much money is set aside for teachers' wages, the maintenance of school buildings, text books, or research at universities (Tweede Kamer: Der staten-Generaal, 2019). This gives a good indications about priorities of the cabinet and thereby what society values because the cabinet is democratically elected and therefore represents the broad public.

Besides this, the movement of people and the gravitational force of a group of people, described in chapter 5.2 are still included.

Phase 2: Partially automation and new variables

It is vitally important for mobility to take into account the environment of users which has a profound impact on the always and rapidly changing mobility needs. So, having an up-to-date understanding of what is valuable to society is important for this proposed mobility system to deliver desirable results and product experiences. This is achieved by increasing the frequency and quality of the value assessment. In this phase the frequency is increased by automating more aspects of the process. Quality is increased by including more factors which are not captured in the budget memorandum, movement of people analysis or the gravitational force of a group of people analysis. For example, data traffic on a certain location (social media activity, payment traffic and more) would be an interesting variable to add in order to improve the determination of societal value.

Phase 3: Big data scraping

Big data scraping is the process of importing information from multiple sources into an online or offline database for a specific purpose. The last phase makes use of this technique too by linking several big data pools together. This could be all kinds of different data. Some data will be updated every hour while some data maybe updated on a yearly basis. This should lead to the most up-to-date dataset which can be used by the backstage. It is a very complex process compared with solely using the Budget Memorandum in the first phase. This sub-system is a carefully designed and engineered system on its own. More research is needed to further specify this system and to what extent this can be automated via AI.

Backstage

Essential to the success of the mobility network are the different Flock Application programming interfaces (API's) that will evolve through time. The API can be considered the recipe of a great meal while the data provided by the support processes are the ingredients. Just like every meal, having good ingredients is no guarantee for a great meal. They do however form a good basis. The same is true for the backstage processes. API's contain the algorithms that determine the socio-economic value of an area as well managing all other information that is needed and generated by the mobility system. Every new API is linked to a new phase in the front stage. With every new API, user interfaces will be updated as well. The set-ups of the different API's are designed with knowledge from a PwC Senior Data Science Consultant and desk research.

API 1 Low complexity Low resolution

To start with, node influence metrics can be used to make sense from the people movement data. Node influence metrics measures that rank or quantify the influence of every node (also called vertex) within a graph. (BenLinus1214, 2015) A node will be, in the light of this project, a geographical region. Using this method allows to rank every geographical location by the movement of people and amount of people.
Lastly there are two ways of determining the value (or ranking) of each area. The PageRank algorithm or Centrality theory could be used to do this. PageRanking, developed and used by Google, is an algorithm which counts the number and quality of links to a page to roughly estimate how important the website is. It assumes that more important websites are likely to receive more links from other websites. (Google, 2014) The mechanism has proven to be successful on classifying a considerate portion of the internet. Therefore, I assume that a working principle like this could be used in the case of this mobility system as well. Another way to analyze the value of each geographical area is by making use of the centrality theory. This mechanism is able to rank nodes in a network by answering the question "What characterizes an important node". The word important has many different definitions. There are two "kinds" of important regarding to this theory which will mostly be affected by the Budget Memorandum. Important can mean which "network flows" are important according to pre-defined favorable flows. In this project, favourable flows are flows that heads to socio-economic weak areas. Another definition of importance focusses on network

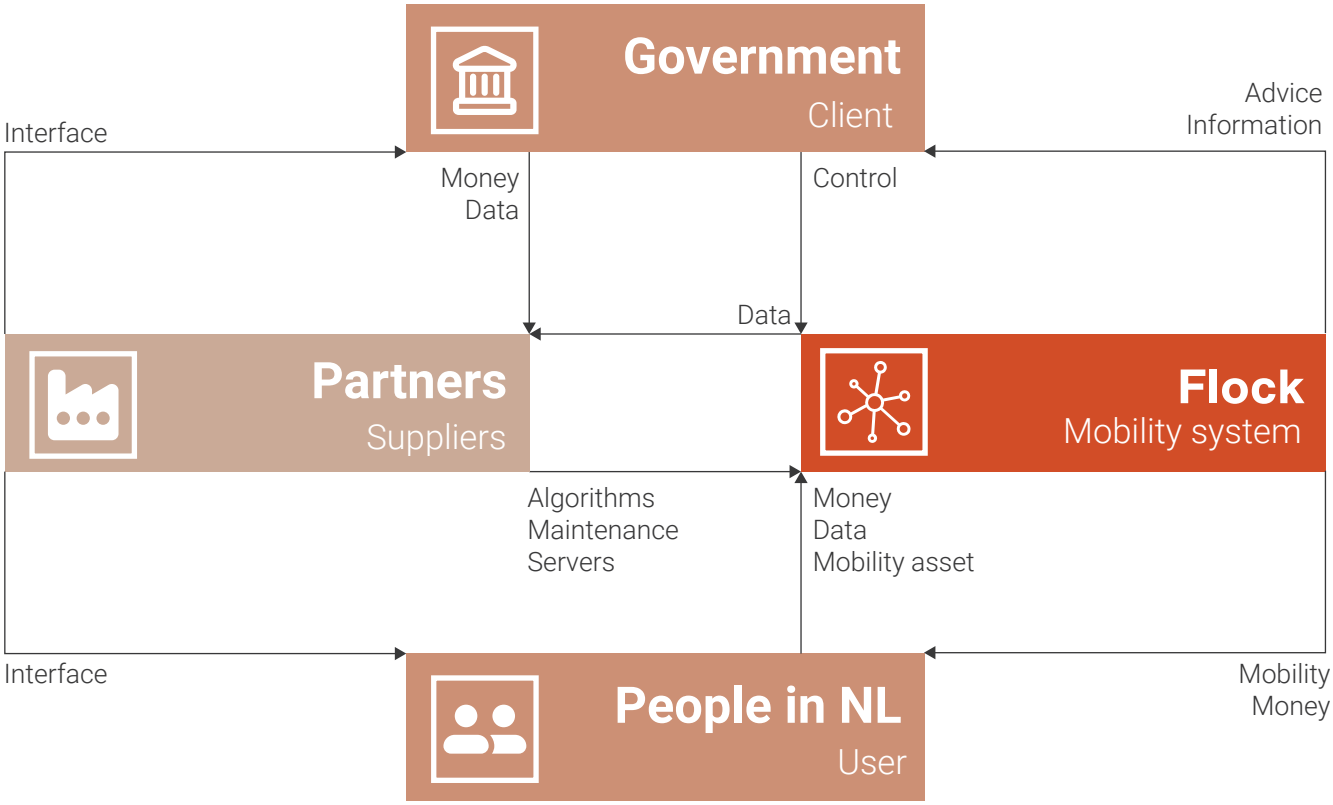


Figure 39 A visualization of involved stakeholders and their exchange of value in the final design. New in this overview are the partners. Partners, paid by the government can partially or completely take over tasks that are associated with making the mobility system work correctly (Support processes, Backstage and Frontstage). Think of programming the API's and storing data.

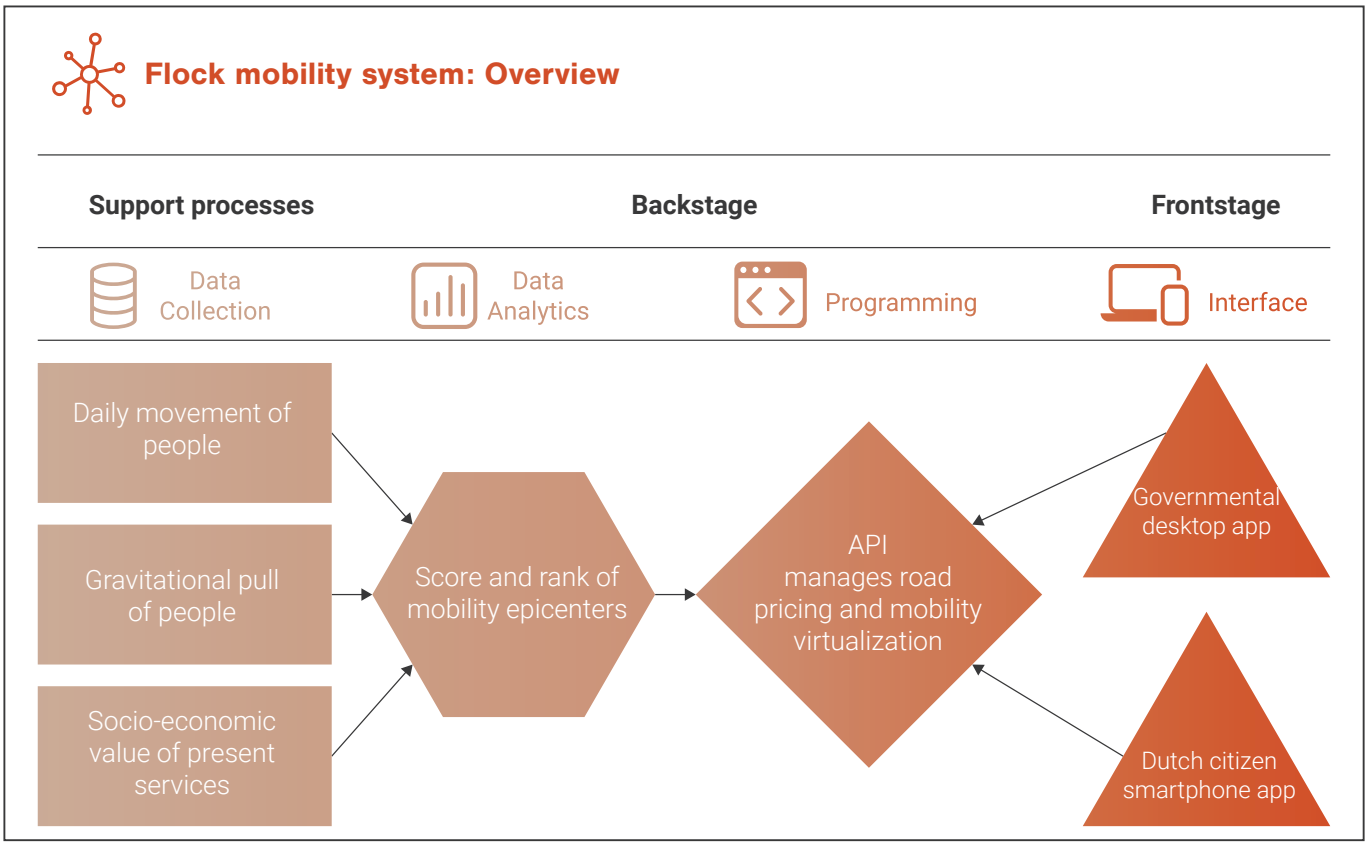


Figure 40 Schematic representation of Flock.

cohesiveness. Flows that are most favorable for the network cohesiveness are ranked higher. The second definition seems to be more fitting since the goal of this project is to reduce socio-economic inequality. However, more research is needed to determine viability, feasibility and desirability for this mobility system to use this form centrality theory or page ranking. It is expected that this version will have relatively low complexity and resolution compared to the next API's. It could be considered the minimum viable product of this system. This function will mostly focus on making essential features work before upscaling it.

API 2 More variables slightly higher resolution
API 2 is in essence quite similar to API 1. The main difference is that it makes use of more datasets and it is partially automated. This in line with the developments in the support processes making more frequent renewing of the valuation definitions possible. Another big difference is that this API is built to support road pricing meaning that besides this API ranks geographical areas based on their socio-economic value for society, it also gives a recommended pricing scheme which should lead to less socio-economic inequality.

API 3 Countless variables
The last API is the most complex API of all. This version makes use of artificial intelligence to uncover the hidden patterns in the big data pools. It is able to determine the value of a geographical location on near real-time speed. At the moment this is not possible with current computational power. However, the PwC Senior Data Science Consultant said during a conversation that chances are high that this is possible in 15 years time. Today API could be possible on a small scale (limited variables and data quantities). In the future this also should be possible on national scale or European scale because it is expected that computer power further increases in the future according to Moore's law (Brock, 2006). On top of that this API manages all assets which participate in the mobility virtualization. Key to this asset management is the possibility to use all kinds of different smart locks which are third-party manufactured. This makes mobility virtualization vastly more accessible to the broad public since more vehicles can participate.

Front stage

The front stage consists of all actions that occur directly in view of the user. These actions can be human-to-human or human-to-computer actions. All actions are divided in three phases which corresponds with the earlier mentioned three phases.

Phase one: Government and mobility provider computer application
The government will make use of a computer desktop application to grant and manage mobility licenses.
The mobility provider will use the same application for smartphone, tablet or embedded in a piece of hardware to be able to prove that they meet the obligations set by the government. GPS data combined with invoices is sufficient to accomplish this. Chances are high that some mobility providers will also interact with a piece of hardware, a smart GPS tracker. This tracker is made available by the government to those who need a reliable system to gather GPS data and invoices to prove that they meet the obligations. Mobility providers are not obliged to use this system if they have another system which is able to gather the required data.

Phase two: Government and citizen computer application
An updated version of the governmental software will be released. Biggest change in the software is that the government now has the ability to manage road pricing of different zones for all vehicle owners. Citizens have access to a new smartphone app and website on which information of the prices from different zones are displayed together with a forecast of one year that is updated every time the value definitions are updated. Additionally, vehicle users are able plan routes to see how much road pricing they need to pay per journey and they are able to see per vehicle what they need to pay in total for road pricing that month.
During this phase all citizens have the same choice as the mobility operators had in phase one when it comes down to reporting vehicle usage. However, every newly bought vehicle should have a GPS tracker built-in by law which is linked to the license plate number. Vehicle owners who are not able to provide the government with the correct data are fined.

Phase three: Updated government and citizen computer application
The most complex software version will be introduced during this phase of the project. This version gives users access to the mobility virtualization service. The software has new functionalities to look for available vehicles and use them as well grants the ability to manage vehicles which are privately invested in the network. Besides this new functionalities both the governmental and citizens application and website are updated to ensure that they can handle faster refreshing rates of societal value definitions on a more detailed resolution.

GPS trackers from the last phase can still be used during this phase. However, a smart vehicle lock is required if a user wants to use to the mobility virtualization functionalities. This lock should have access to the internet to enable the user to remotely manage the vehicle. It is assumed that by that time most vehicles will have a smart lock pre-installed on purchase which is already the case today with more luxuries models.

Scale

The top horizontal diagram shows different geographical scales on which different elements of the mobility network is going to operate. By introducing it first on a smaller scale, product features can be more easily tested and improved. When the desired system performance and reliability is achieved at this scale, network features will be scaled up and tested and improved following the same protocol eventually leading to a national scale with a resolution which is infinitely small.

Metropole region Eindhoven, plus regions and hexagons will be elaborated on in more detail.

Metropole region Eindhoven
Metropole region Eindhoven could be a very good area to start a pilot with according to Ingeborg. There are various reasons why;

- The region is a medium sized area consisting of 21 municipalities with a total surface of 1.457,81 km² and a total of 750.000 residents (Metropool Regio Eindhoven, 2019). The two largest centers in the region are Eindhoven and Helmond which experience limited agglomeration.
- Important infrastructures like highways, railways and data nodes are present in this region which influence regional, national and international mobility demand and supply.
- The previous form of the region, *Samenwerkingsverband Regio Eindhoven*, is similar to the current region. It was responsible for managing public transport from 1993 till 2015. This means they have the resources and experience with organizing mobility on this scale.
- There is a wide variety of services present that have different societal values including high-tech campus, Technical university, Airport, Stadiums, Industry, protected nature areas, event locations and many more. It is a good representation of all existing services in Netherlands.
- Metropole region Eindhoven is a border region. This brings additional challenges concerning foreign traffic flows which need to be taken into consideration from the start.

Figure 41 A visualization of the governmental interface of Flock.

If a pilot in this region leads to the desired results, chances are higher that upscaling to other regions could be successful since a broad spectrum of challenges have already passed from which learning have been gained.

Concession area's
Next to city regions like Eindhoven, the Netherlands is also sub-dived into 14 concession areas. These are areas, smaller than provinces but larger than municipalities, in which concession packages are offered. These packages include the right to deliver certain mobility services if certain rights and obligations are met. A map of all area's can be found in appendix H. These areas will be used when upscaling the mobility system because they have an existing network of processes and resources which can be used to unroll a big system like Flock.

Hexagons
Another scale needs to be used on which the mobility service can be unrolled with a gradually increasing resolution. This is necessary to be truly able to decouple and mobilize socio-economic centers from their infrastructural equivalent. Central place theory suggests using hexagons for this instead of circles and squares. Circles have an equal distance from center to the edge but leave open space between adjacent circles when not overlapping. Overlapping circles will mean that certain areas have one or more socio-economic societal valuations which may not work within the current mobility system. Squares can completely cover the Netherlands. However, squares do not have equal distances from center to edge. This is important to have otherwise it is not possible to fairly compare different areas with each other. Using hexagons is a compromise between the geometrical properties from circles and squares. At the start, hexagons with a radius of 30 KM can be used with gradually decrease to hexagons with a radius of 50 M or smaller if necessary.

Figure 42 Metropole region Eindhoven

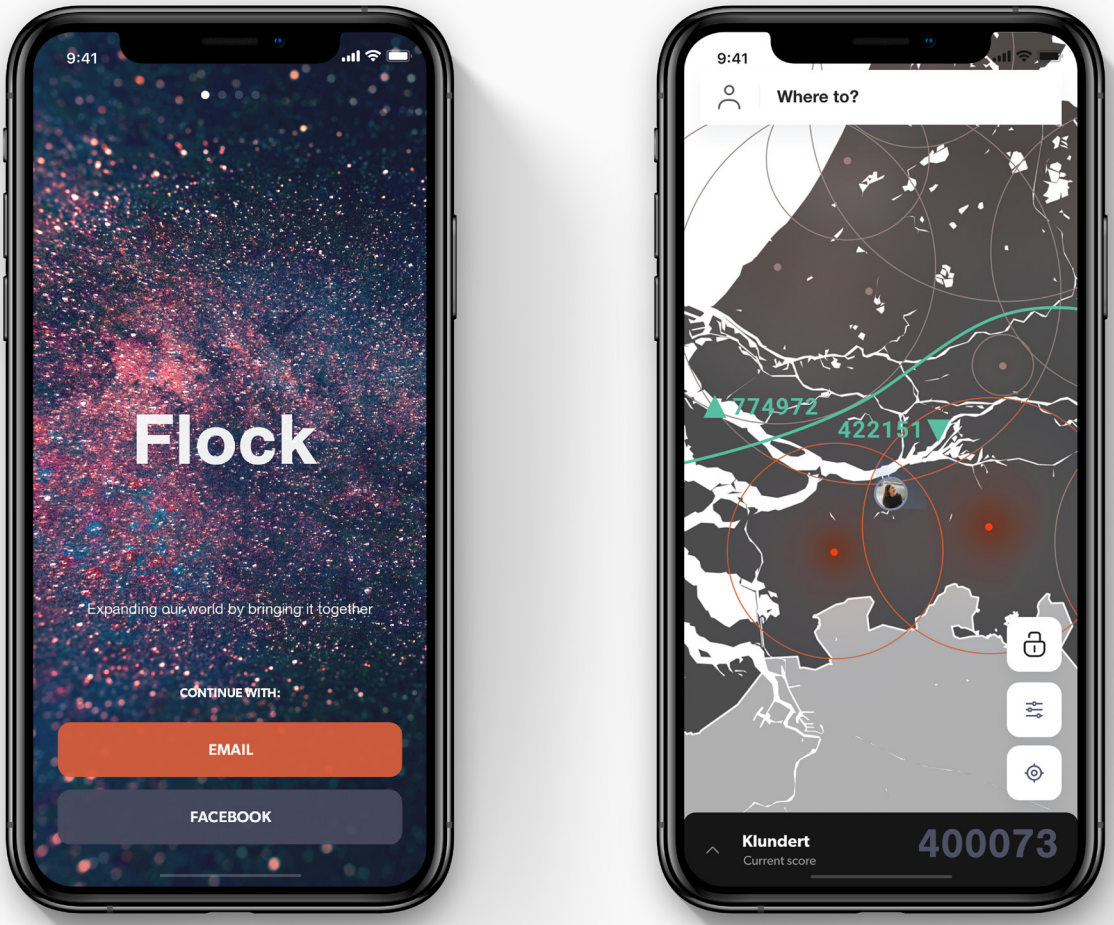


Figure 43 A visualization of the smart phone app which the user will be using to interaction with the Flock mobility system.

8.0 Design Recommendations

Many insights were gained during the creation of the final design. I was able to translate most insights to adjustments or new additions to the final design within the time constraints of this project. However, there were still some gained insights that I consider very important to the design but I was not able to integrate in the final design proposal. This chapter addresses these aspects through design recommendations that could be possibly be integrated in future research.

8.1 Be aware of individual social-economic characteristics

The goal of this whole design project was to reduce future socio-economic inequality by creating a mobility product -service system to geographically even out socio-economic value. With that design solution I mainly focused on three of the five components of that prevents certain groups of people to participate in the economic, political and social life of the community. Those three were the land-use, transportation and temporal component. I did barely focus on the individual and cognitive component. (see chapter 3.2 for more information). Having not focused on those two components is not necessarily bad. However, it indicates that not all aspects are taken into consideration. I was being made aware of this during the interview that I had with Niharika. She made me aware of the fact that I was not focusing on the individual socio-economic characteristics of each potential user. Focusing on this would add an additional layer of complexity. To give an example, a person who is not being able to drive a car, physically and cognitively, considers public transport as more valuable over big highways. Another example, someone who is passionate about sitting on the couch and watch Netflix all day could still not be incentivized to do something else when cost of traveling in his or her area is low or non-existing if Netflix is all he or she cares about. These are just two examples of components that affect mobility need and demand that I did not take into consideration in this final design.

There are two reasons why I did not focus on integrating those two components. The first reason was time. Within the time I had for this design project I was not able to incorporate these components as it drastically raised the complexity of all design aspects making it even more difficult to come up with an integrated design. The other reason is that focusing with the mobility system on people on an individual level could have unwanted future effects. The goal of the vision was as follows: People to responsibly use their short-term mobility to create a better self. Essential is that the succes of it depends on the increase and/or improvement in short- and longterm socio-economic prospects for themselves and others too. Moreover, these prospectives should honor the creation of a better world for flora and fauna. A better self and increased and/or improved prospects could mean many different things to different people depending on their personal preferences. With that in the back of my mind I do believe that the future context does not need an intervention that decides the meaning of that for them, looking at the clusters in future context (chapter 2.2). A design which is even more normative than the current design, which determines for the user what a better self is or improved and/or increased prospects, only reinforces the discovered future context. Such design would only be another factor which disables people to take personal responsibility to effectively use their mobility to grow their own prosperity or that of others. I recommend to be aware of this if you still wish to pursue a design which incorporates all components which has the same goal as my final design proposal. It is quite possible that you very quickly create something that actually makes the future problem even worse.

8.2 Scale up to Europe

I decided to focus on the Netherlands at the start of the project for two reasons. PwC Netherlands was my client so researching the future of mobility in the Netherlands was most valuable for them. The other reason was that by doing so the project was going to be manageable. I did keep Europe and the rest of the world in the back of my mind while designing so I would not end up with a design which is only applicable to the Netherlands. The designed mobility systems are applicable to other countries as well with some minor changes. It is expected that the scale and the definition of what is valuable to society need to be changed when applying this concept to another area.

Focus first on Europe when it is wished to scale up the design or introduce an international factor to the concept. It is expected that it also helps to reduce socio-economic inequality more effectively with the system because it introduces competition to strong urban areas which are equivalent to the Randstad which is lacking within the Dutch borders at the moment (Braan, 2016).

Scaling-up to a European level also drastically improves feasibility of the concept because than it would not test European law. A concept with similar characteristics, a toll for all road users of regional and provincial roads and highways in Germany, was prohibited by the European court 18th of June 2019 (Dillen, 2019). Main reason, the plans were too discriminating for foreign car users. This forces other European countries like Denmark and Belgian, which were busy with similar plans, to revise the plans or look for different solutions into other directions. Scaling the proposed mobility system up to European level would avoid this problem because it will treat all European vehicle users the same way. However, on European level many more difficulties would be introduced. This includes European politics which would make it hard to realize a concept on such scale before the end of 2035. More (ethical)research is needed to be completely sure if the proposed final design could be introduced successfully first on a national scale and maybe later on a European scale without breaking European laws.

8.3 Tools for an effective political discussion on mobility

The final design proposal is a normative concept. Therefore, I expect passionate political discussions about the proposed concept during the start-up phase. In particular, I expect long and complex discussions about what services, that are offered by the state and individuals, are most valuable for society. These discussions are morally driven and do not necessarily have a good or bad conclusion. At elections this adds

another difficult dimension to the voting process because in this mobility system voting indirectly affects your mobility as a citizen. There is a possibility that the mobility issue adds a layer to the democratic process resulting in undesirable results. So, I recommend the mobility system to be validated even more thoroughly by people with various expertises, and if necessary, take action to limit or reduce the undesired outcomes. Additionally, researching tools which could help citizen to better understand their mobility situation and how to affect it via voting is interesting as well.

9.0 Implications for PwC

This design project has been conducted within and for PwC. It was an exploratory project for PwC. No clear goal was set for PwC besides the design goal I set for myself at the beginning of this project. However, I did find many interesting opportunities and challenges within the future of mobility which are interesting for PwC or their clients. This chapter gives an overview of these challenges and opportunities and how PwC should approach them.

9.1 Project leader

First and foremost, PwC could be the project leader of this vast mobility project. Their experience with large projects with societal impact carried out together with the various governmental institutions proves their capability to handle such a project. Taking the lead means that PwC, and any partner company they may hire to co-operate, take most responsibility for the outcome of the project.

The first step in this is to have an open conversation with the Ministry of Social Affairs and Employment and Ministry of Infrastructure and Water Management about this research. During this conversation visions can be shared, motives can be understood and opinions can be expressed related to this topic and this final design in particular. The outcome of this conversation can serve as a good indicator to determine if the project is viable, desirable and feasible and if the government is actually the right client. If that's all right PwC has to create a multidisciplinary project group which first task is to create project proposal from my graduation project for the ministries. This will be a complicated task which needs some time because there are a lot of rules involved in creating project proposals for the government. I suggest that the first project proposal is focused only on the first phase, the first pilot with metropole region Eindhoven to be exact. Results from this pilot are important as they can prove if the project is viable, desired and feasible. Besides that, I expect a lot of political discussion to develop around these results which is the right opportunity to see what kind of disruptive effect this project has on politics. These outcomes will mostly shape the next steps of the project that need to be undertaken to go to phase two and three.

9.2 Executive role

PwC also is able fulfill an executive role within this mobility system. There are a variety of tasks and responsibilities that PwC could fulfill or complete. These will be explained corresponding to the different rows found in the design roadmap.

Support process

PwC is able to organize the collection and safe storage of the data that is needed for the mobility system. At the beginning PwC is able to do most by themselves. I advise PwC to work together with more partners to spread the risk and to guarantee system performance and integrity during phase two when road pricing is introduced. Also, PwC can play an advisory role and mitigating role between different specialists if the process becomes more complex in the future and more specialized knowledge is required from partners. Think about cybersecurity, artificial intelligence and privacy.

Backstage process

There are many opportunities for PwC in backstage process of this mobility system in which they can use their expertise which they are known for. To start with, PwC could develop a more detailed valuation method that valuates geographical areas and ranks them. On top of that pricing strategies and financial designs for both the new concessions model and the future road pricing model could be developed by PwC with in-house knowledge. Both can thereafter be seamlessly integrated in a one API built by PwC.

Frontstage process

Different interfaces need to be developed to let the different users interact with the information that is created in the backstage process. Also, here PwC have several opportunities. PwC could develop the website, desktop app and smartphone interface. They would not be able to create the hardware interface, the GPS tracker that is offered by the government. PwC does not have that kind of in-house knowledge.

Scale

PwC is well able to coordinate the state of affairs of every phase as well the transitions between the different phases. They could provide several auditing and assurance services that provide the ministries with the required results and insights they can communicate to the cabinet. In the end ministries also need to adhere to the Open Government Act and are also accountable for what they are doing with tax money.

10.0 Conclusion

In this last chapter I will check if the sub-questions defined at the start of this project are answered. Additionally, I will check if the proposed design solution contains all defined product qualities to be sure that it is in line with the vision statement. Finally, I will reflect on this graduation project as a whole.

At the start of this graduation design project I have defined five questions to finds answers for during the process. The following paragraphs answer these questions which will be the conclusion of this graduation project.

10.1 Answers on pre-defined design questions

What is the current mobility constellation?

A mobility constellation is a way to describe the characteristics of a mobility system by using three aspects of mobility. These are; movement, meaning and practice. The enduring relations and structures between those three aspects of mobility are called 'Constellations of mobility', reflecting society's norms and values. The current constellation is one in which (new) mobility providers reinforce socio-economic inequality between people (meaning) by mainly making hypermobile people even more mobile (practice). This is being done by solely focusing on the economic benefits of reducing the travel time by adding more infrastructure (movement). This creates a relative mobility gap which is increasing. The globalized society of today is focused on individualization, reflexivity, social differentiation and increasing socialization, commoditization and regulation (Ascher, 2017).

What does a future mobility constellation look like?

Through research, I created a future context in which I identified twelve cases. In these cases, people are unable to take personal responsibility for their mobility to create favorable conditions in which they and others are able to create a better self. It will become worse if no action is taken to prevent this from happening. I envision a future mobility constellation that stimulates people's responsibly to use their short-term mobility (movement) to create a better self. Essential is that the succes of it depends on the increase and/or improvement in short- and longterm socio-economic prospects for themselves and others too. Moreover, these prospectives should honor the creation of a better world for flora and fauna (meaning). This is achieved by creating personal interdependencies, between people's short- and long-term socio-economic prospects with people's mobility surplus. (practice)

What form of mobility is meaningful in a future constellation?

A meaningful form of mobility is one that has all product qualities that are distilled from the analogy of the relationship between a bird and the flock. This translates to a meaningful form of mobility which, stimulates stronger users to display kindness and concern for others (caring), functions according to a plan (structured), stimulates the desire of users to be part of a group (belonging), promotes the desire to maintain an overall sense of coherence (unity), allows all users to choose their own actions and words with caution, showing self-control over impulses for these long-term goals (prudence), promotes justice, fairness and the unbiased treatment of all people (equity) and is necessary to use by all users (necessity).

The final design encompasses all these product qualities. The movements of hypermobile people cause mobility epicenters (socio-economic value) to move to less fortunate geographical area (caring)(equity) because of a system with pre-defined rules (structured). This increases the feeling of unity within such an area and between area's. The map which makes the socio-economic score visible to people allows them to make well-informed short- and long-term choices (prudence). The same map also creates a sense among all users as it makes them aware that their personal mobility experience is just a part of something bigger. Roadpricing is a mechanism which is used to to redirect traffic flows in a way that is beneficial to reducing socio-economic inequality (necessity). Lastly, mobilty virtualization creates a sense of belonging because it relies on collaboration between users to improve each others mobility.

How does a system embody a meaningful form of mobility?

This meaningful form of mobility can be embodied by mobility systems called Flock. Flock is an extensive mobility system that consists of three phases which are introduced in Netherlands over a timespan of 15 years. Phase one introduces an updated concession model which enables the government to regulate upcoming mobility providers to think about offering service in certain areas from a sociological perspective instead of solely an economic perspective. Phase two introduces a road pricing concept to all Dutch vehicle owners. A fee needs to be paid depending on journey origin and destination. Traveling to a socio-economic weak area is cheaper than the other way around. Lastly, phase three introduces mobility virtualization. This enables people to virtualize their mobility, allowing them to utilize their mobility embedded in the products they own free from time and location. Additionally, it gives people more access to mobility and incentivize them to use their mobility in a more responsible way.

10.2 Reflection

The basic reason to carry out a graduation project is to earn enough credits to obtain the masters degree. But an evenly, perhaps more important reason to me was the opportunity to get more acquainted with the VIP method of design before i graduated, and for a number of reasons. First, VIP allows me to combine knowledge and expertise obtained during my Bachelor Industrial Design at University of Technology Eindhoven with my IPD master program from TU Delft. I discovered that it was the perfect way for me make my intuition explicit and concrete which is necessary to be able to communicate my ideas with others. That is something I normally struggle with. Additionally, VIP is a design method which truly focuses on the designing the future what I really motivate me. Many design methods or approaches focus on the problems of today instead of trying to come up with a radical design which describe how we would like the future to be. Designing for the future gives me the most energy while it reveals and creates many opportunities. The reason that I wanted to do this project within the corporate context of PwC is that I wanted to learn about what it is like to follow the VIP in a real-life context. I felt like I have missed the connection with the real-world during the VIP elective. While I understood the idea, I had troubles with visualizing how a VIP process would look like within real-life context. It felt like saying that you could drive a car because you passed the theory exam. I want to have more experience with VIP in the real-life context because I expect to use the method more often in my future career. The PwC organization was the perfect context to learn in. It offers a large network of professionals and an equally large knowledge base I could use during the project. Also, it is a rather traditional context which, in my opinion, need more VIP like projects to keep up to date with the wishes and needs of the clients and inspire people within the company.

In the end the overall result is what I am most proud of. A visionary mobility system focused on creating a better future world for everyone. I was able to let go of all those ideas and design direction that I had in my mind at the beginning of the project, that distorts your ability to come up with a truly unique design. The act of gathering context factors and structuring them to create a future context was very helpful during that process. Not only the final design sparked great interest among various departments of PwC, but also the process itself and the insights I gained from it have attracted the attention of various colleagues. They are eager to do something with the result within their own field of expertise. For me this is the proof that I was able to successfully use the VIP method within a traditional context to create a radical design.

There were also some matters that went less well than I had anticipated. Main reason for this was the complexity the topic mobility is surrounded with. The more I researched it and tried to wrap my head around it the more difficult it got. At some point I was not able anymore to use my common sense as a designer, making things unnecessary difficult or even more complex. As a result that I had troubles with creating a vision statement. While the creation of the vision statement is a big part of the VIP method and a pivotal moment in the design process, I still think it did not go smooth. I experienced a lot of internal friction when trying to come up with and write down a vision statements that actually describes how I envision things. As mentioned earlier, topic complexity made it difficult to capture the nuances on paper in a few lines. In addition I believe I held on too much on the VIP design method. From an artistic point of view, I cramped up which is not convenient in this phase in the project. Therefore, creating the vision statement took way more time than I had anticipated for resulting in a four-week delay of the graduation date. I needed more time to be able to work out the vision statement to a final design. Lastly, I focused too much on pleasing PwC in the first half of my project. I was not aware of that but both Matthijs and Silje made me aware of it. By pleasing PwC I did not stay true to my own plan which caused my project to lack a clear goal. From the moment I knew that I made sure that my project was first and foremost a graduation project and second a project PwC can use later on. This resulted in my project regaining its clear focus and becoming more original again what PwC was looking for.

I would have made more use of my common sense and focused more on staying true to my own agenda if a project like this came across in my future career. I learned that by making a considered choice instead of making it more complex ensures that your project progresses. It is impossible to know beforehand how your choice will turn out. Also, people want to work with you not necessary for the fact of you doing things they want but because of the things you normally do. Therefore, I will stay a more true to my own agenda next time.

Figure 44 Here I am busy making clusters of all context factors.

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11.1 Images

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Figure 11
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Figure 19
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Figure 26
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12.0 Appendix

A Context Factors

	Cultural	Psychological	Demographic	Sociological	Economic	Biological	Evolutionary	Technological	Total
Principles	1	-	1	4	2	7	8	2	30
States	19	-	3	12	11	3	-	5	53
Trends	12	-	1	7	11	6	-	6	43
Developments	11	5	3	1	4	1	-	8	27
Total	43	5	8	23	28	17	8	21	**153**

Figure 45 A table displaying in total

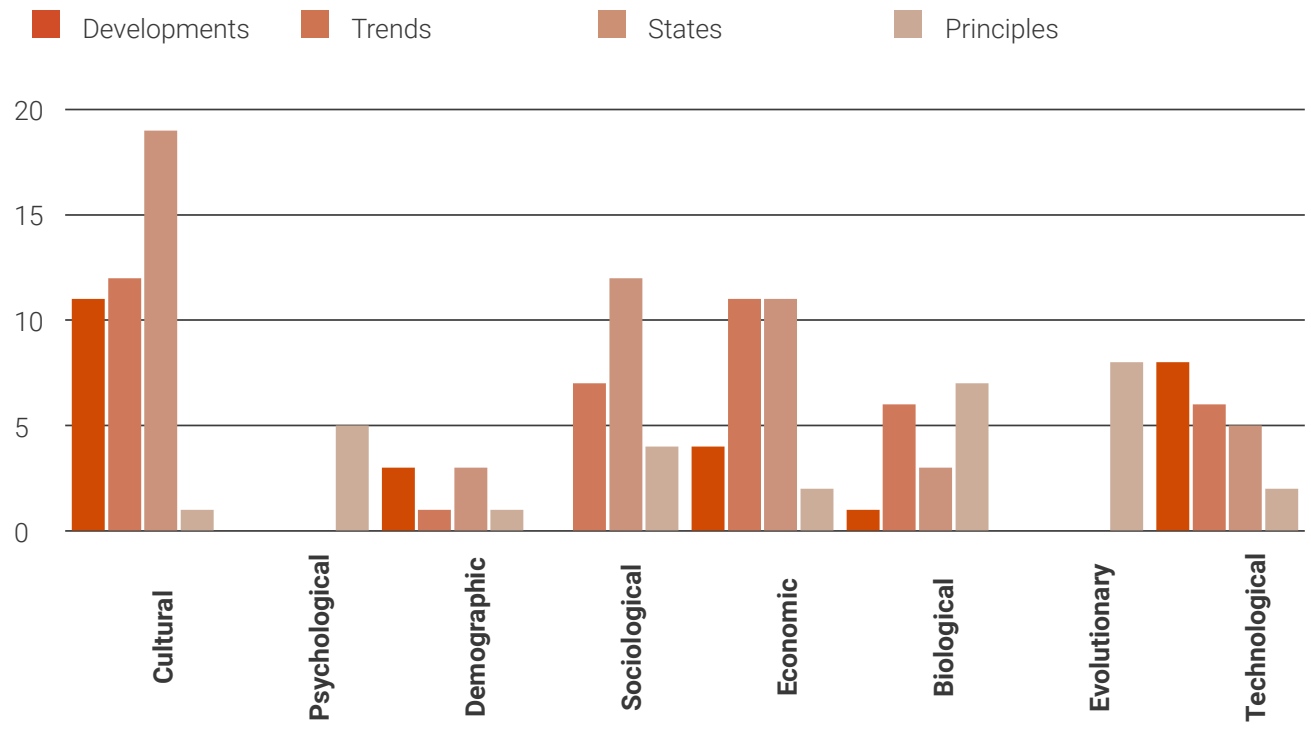


Figure 46 A bar chart visualizing the different types of context factors in the different fields. Although context factors in every field were found, context factors in the psychological field and evolutionary field are limited. This difference is number of context factors is restored by the other fields.

Graduation Project Donovan Lewis: Context Factors				
Index	Types	Fields	Novelty	Factor
Item 1	State	Cultural	4	Dutch Internetproviders are not required to declare illegal downloac
Item 2	Principle	Psychological	8	People who live in diverse neighbourhoods are more helpful
Item 3	State	Sociological	4	Many people in the Netherlands want to live more sustainable. How
Item 4	Trend	Sociological	8	More parents keep an eye on the digital presence of childeren
Item 5	State	Sociological	4	Everyone has the right to life, liberty and security of person.
Item 6	State	Sociological	4	Everyone has the right to freedom of movement and residence withi any country, including his own, and to return to his country.
Item 7	State	Sociological	4	Everyone has the right to seek and to enjoy in other countries asylu of prosecutions genuinely arising from non-political crimes or from a Nations.
Item 8	State	Cultural	4	Everyone has the right to a nationality. No one shall be arbitrarily de nationality.
Item 9	State	Cultural	4	Everyone has the right to own property alone as well as in associatio property.
Item 10	State	Cultural	4	Everyone has the right to freedom of opinion and expression; this rig and to seek, receive and impart information and ideas through any m
Item 11	State	Cultural	4	Everyone has the right to freedom of peaceful assembly and associa
Item 12	State	Cultural	4	Everyone has the right to take part in the government of his country has the right of equal access to public service in his country. The will government; this will shall be expressed in periodic and genuine elec be held by secret vote or by equivalent free voting procedures.
Item 13	State	Cultural	4	Everyone has the right to a standard of living adequate for the healt food, clothing, housing and medical care and necessary social servic sickness, disability, widowhood, old age or other lack of livelihood in childhood are entitled to special care and assistance. All children, wh protection.
Item 14	State	Cultural	4	Everyone has the right freely to participate in the cultural life of the advancement and its benefits. Everyone has the right to the protecti scientific, literary or artistic production of which he is the author.
Item 15	Principle	Biological	1	The Netherlands need to reduce CO2 emmission with 49 percent by

	Reference
lers	nu.nl. (2019). Rechter staat eerste Nederlandse 'downloadboete' in de weg. [online] Available at: https://www.nu.nl/internet/5732016/rechter-staat-eerste-nederlandse-downloadboete-in-weg.html [Accessed 14 Feb. 2019].
	Narayanan, J. (2019). People who live in diverse neighbourhoods are more helpful – here's how we know. Retrieved from https://theconversation.com/people-who-live-in-diverse-neighbourhoods-are-more-helpful-heres-how-we-know-94878
ever, it is experienced as difficult in practice.	Spierings, S. (2019). Nieuw campagne duurzaam leven. de Volkskrant.
	van Noort, W. (2019). Áltijd een oogje in het zeil. NRC.
	Universal Declaration of Human Rights. (2019). Retrieved from http://www.un.org/en/universal-declaration-human-rights/
in the borders of each state. Everyone has the right to leave	Universal Declaration of Human Rights. (2019). Retrieved from http://www.un.org/en/universal-declaration-human-rights/
m from persecution. This right may not be invoked in the case acts contrary to the purposes and principles of the United	Universal Declaration of Human Rights. (2019). Retrieved from http://www.un.org/en/universal-declaration-human-rights/
eprived of his nationality nor denied the right to change his	Universal Declaration of Human Rights. (2019). Retrieved from http://www.un.org/en/universal-declaration-human-rights/
on with others. No one shall be arbitrarily deprived of his	Universal Declaration of Human Rights. (2019). Retrieved from http://www.un.org/en/universal-declaration-human-rights/
ght includes freedom to hold opinions without interference nedia and regardless of frontiers.	Universal Declaration of Human Rights. (2019). Retrieved from http://www.un.org/en/universal-declaration-human-rights/
tion. No one may be compelled to belong to an association.	Universal Declaration of Human Rights. (2019). Retrieved from http://www.un.org/en/universal-declaration-human-rights/
, directly or through freely chosen representatives. Everyone l of the people shall be the basis of the authority of ctions which shall be by universal and equal suffrage and shall	Universal Declaration of Human Rights. (2019). Retrieved from http://www.un.org/en/universal-declaration-human-rights/
h and well-being of himself and of his family, including es, and the right to security in the event of unemployment, circumstances beyond his control. Motherhood and nether born in or out of wedlock, shall enjoy the same social	Universal Declaration of Human Rights. (2019). Retrieved from http://www.un.org/en/universal-declaration-human-rights/
community, to enjoy the arts and to share in scientific ion of the moral and material interests resulting from any	Universal Declaration of Human Rights. (2019). Retrieved from http://www.un.org/en/universal-declaration-human-rights/
y 2030	Klimaatakkoord. (2019). Retrieved from https://www.klimaatakkoord.nl/

Item 16	State	Economic	3	The improving economy leads to more infrastructure usage
Item 17	State	Economic	2	The Netherlands has a shortage of 263 thousand residential units. T 2021
Item 18	State	Economic	4	Brexit have made consumers avers of buying
Item 19	State	Economic	3	On average, 25 grocery delivery services, besides other delivery serv
Item 20	State	Economic	1	The bicycle counts for 25% of Dutch mobility (transport)
Item 21	State	Economic	2	In the Netherlands 50% of car trips is shorter than 7.5 km
Item 22	Development	Demographic	1	The number of older persons — those aged 60 years or over — is exp by 2100, rising from 962 million globally in 2017 to 2.1 billion in 205
Item 23	Principle	Economic	5	Europe's single market is an engine for building a stronger and fairer to move more freely it opens up new opportunities for citizens, worl growth Europe so urgently needs.
Item 24	Development	Biological	9	40 percent of all insect species quickly is quickly reducing in number
Item 25	Principle	Biological	8	A noisy environment has a negative impact on health and well being
Item 26	Development	Demographic	1	Increasing rate urbanization rate. By 2030, 60% of the world popula
Item 27	Development	Economic	1	The Dutch retirement age will increase to 67 year by the year 2021
Item 28	Development	Technological	2	ITU estimates that at the end of 2018, 51.2 per cent of the global po is increasing.
Item 29	Development	Technological	7	Global mobile data traffic is projected to increase 673% between 20
Item 30	Trend	Biological	6	There is a slight drop in the number of people calling in sick in the N less and women 15%
Item 31	Trend	Biological	4	Mental illnesses is slightly growing as reason for calling in sick at wo
Item 32	Development	Cultural	9	It's forbidden to operate any mobile electronic device while cycling i device is not actively held in the hand is allowed (hands-free navigat
Item 33	Principle	Demographic	9	Demographic change in gentrifying neighbourhoods appears to be a and the relative affluence of in-movers.
Item 34	State	Economic	2	Global poverty rates have been cut by more than half since 2000. St their families on less than the international poverty line of US$1.90 line of US$1.90 a day

	van Lieshout, M. (2019). Wegen en treinen worden almaar voller, moet er nóg meer asfalt en spoor bij? 'Heel veel files hebben niets met capaciteitsdruk te maken'. Retrieved from https://www.volkskrant.nl/nieuws-achtergrond/wegen-en-treinen-worden-almaar-voller-moet-er-nog-meer-asfalt-en-spoor-bij-heel-veel-files-hebben-niets-met-capaciteitsdruk-te-maken-~ba6e254b/
hat's more then the estimated need of 235 thousand for	van de Weijer, B. (2019). 263. de Volkskrant.
	van de Weijer, B. (2019). Naderende Brexit fnuikt Britse groei. de Volkskrant.
vice, pass through Amsterdam neighbourhoods	Stil, H. (2019). Na Jumbo de bezorgtsunami. Het Parool.
	Harms, L., & Kansen, M. (2018). Fietsfeiten [Ebook]. Kennisinstituut voor Mobiliteitsbeleid.
	Harms, L., & Kansen, M. (2018). Fietsfeiten [Ebook]. Kennisinstituut voor Mobiliteitsbeleid.
pected to more than double by 2050 and to more than triple 50 and 3.1 billion in 2100	Ageing. (2019). Retrieved from http://www.un.org/en/sections/issues-depth/ageing/
EU economy. By allowing people, goods, services and capital kers, businesses and consumers - creating the jobs and	Internal market. (2019). Retrieved from https://ec.europa.eu/commission/priorities/internal-market_en#background
rs due to loss of habitat by intensive agriculture	Speksnijder, C. (2019). Snelle afname aantal insecten bedreigt natuur. de Volkskrant.
	Renout, F. (2019). Inwoners Parijs ziek door lawaai. Het Parool.
tion will live in cities.	Versnellende verstedelijking. (2019). Retrieved from https://www.pwc.nl/nl/themas/megatrends/urbanisatie.html
	Herderscheê, G. (2018). Kabinet haalt AOW-taboe van tafel: pensioenleeftijd kan minder snel stijgen. Retrieved from https://www.volkskrant.nl/nieuws-achtergrond/kabinet-haalt-aow-taboe-van-tafel-pensioenleeftijd-kan-minder-snel-stijgen~bf1ae087/
opulation, or 3.9 billion people, were using the Internet. This	Statistics. (2018). Retrieved from https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx
017 and 2022	Global mobile data traffic 2022 | Statistic. (2019). Retrieved from https://www.statista.com/statistics/271405/global-mobile-data-traffic-forecast/
etherlands between 2005 en 2017. Men called in sick 17%	Ziekteverzuim | Cijfers & Context | Trends |. (2019). Retrieved from https://www.volksgezondheidenzorg.info/onderwerp/ziekteverzuim/cijfers-context/trends#node-trends-percentage-werknemers-dat-verzuimt
rk. 26.4% in 2005 and 32.7% in 2017	Ziekteverzuim | Cijfers & Context | Trends |. (2019). Retrieved from https://www.volksgezondheidenzorg.info/onderwerp/ziekteverzuim/cijfers-context/trends#node-trends-percentage-werknemers-dat-verzuimt
n the Netherlands on 1 July 2019. Using the device while the tion, listening to music)	Mag ik appen, bellen en naar muziek luisteren op de fiets?. (2019). Retrieved from https://www.rijksoverheid.nl/onderwerpen/fiets/vraag-en-antwoord/mag-ik-bellen-en-naar-muziek-luisteren-op-de-fiets
consequence of lower rates of intra neighbourhood mobility	Freeman, L. (2005). Displacement or Succession?. Urban Affairs Review, 40(4), 463-491. doi: 10.1177/1078087404273341
ill, one in ten people in developing regions are still living with a day. 783 million people live below the international poverty	Goal 1: End poverty in all its forms everywhere. (2019). Retrieved from https://www.un.org/sustainabledevelopment/poverty/

Item 35	State	Economic	2	1.4 billion people have no access to electricity worldwide – most of poverty in many regions is a fundamental barrier to reducing hunger meet future demand.
Item 36	State	Biological	4	3 billion people rely on wood, coal, charcoal or animal waste for cool
Item 37	Trend	Economic	2	The global unemployment rate in 2017 was 5.6%, down from 6.4% i
Item 38	State	Technological	1	16% of the global population does not have access to mobile broadb
Item 39	Principle	Biological	4	Should the global population reach 9.6 billion by 2050, the equivalen natural resources needed to sustain current lifestyles.
Item 40	Principle	Technological	7	Employees perceive personal devices to be more useful, more powe often they are.
Item 41	Trend	Cultural	7	Employees enter into new working relations in which they have the responsible for their results instead of being measured by their 'pres
Item 42	Principle	Sociological	6	Employees appreciate having the option to work when they want an flexibility, which leads to higher levels of work-life balance, which in
Item 43	Principle	Biological	7	Employees who are less able to balance their personal and work life, their private time is now open to intrusion by work, employees may
Item 44	Principle	Evolutionary	9	The psychological Reactance theory predicts that any given person w with elimination, will create and adverse state of arousal called react
Item 45	Principle	Sociological	8	People do not appreciate being told how to behave, and tend to reje
Item 46	Trend	Economic	3	Europe's flexible office space to grow by up to 30% per year over ne

whom live in rural areas of the developing world. Energy and ensuring that the world can produce enough food to	Goal 2: Zero Hunger - United Nations Sustainable Development. (2019). Retrieved from https://www.un.org/sustainabledevelopment/hunger/
king and heating	Goal 7: Energy - United Nations Sustainable Development. (2019). Retrieved from https://www.un.org/sustainabledevelopment/energy/
n 2000.	Goal 8: Economic Growth - United Nations Sustainable Development. (2019). Retrieved from https://www.un.org/sustainabledevelopment/economic-growth/
band networks.	Goal 9: Infrastructure and Industrialization - United Nations Sustainable Development. (2019). Retrieved from https://www.un.org/sustainabledevelopment/infrastructure-industrialization/
nt of almost three planets could be required to provide the	Goal 12: Sustainable consumption and production. (2019). Retrieved from https://www.un.org/sustainabledevelopment/sustainable-consumption-production/
rful, easier to use, and more fund than enterprise IT, and	Harris, J., Ives, B., & Junglas, I.A. (2012). IT Consumerization: When Gadgets Turn Into Enterprise IT Tools. MIS Quarterly Executive, 11(3), 99-112
freedom to decide when and where to work, and become enteeism' at the office.	Johns, T., & Gratton, L. (2013). The third wave of virtual work. Harvard Business Review, 91 (1), 66-73.
d where they want: it leads to higher levels of perceived turn leads to to higher productivity.	Van Heck, E., van Baalen, P., van der Meulen, N., & van Oosterhout, M. (2012). Achieving High Performance in a Mobile and Green Workplace: Lessons from Microsoft Netherlands. MIS Quarterly Executive, 11(4).
run increased risk of experiencing stress. Given much of report higher perceived stress.	Niehaves, B., Köffer, S., & Ortbach, K. (2012). IT consumerization–a theory and practice review. Proceedings of the Eighteenth Americas Conference on Information Systems, AMCIS 2012.
with a behavioural freedom, that is eliminated, or threatened tance.	Brehm, J.W. (1966). A Theory of Psychological Reactance. Academic Press, Inc., London, U.K. Brehm, J.W. (1972). Response to Loss of Freedom: A Theory of Psychological Reactance. General Learning Press, Morristown, NJ. Brehm, J.W. & Brehm, S.S. (1981). Psychological Reactance: A Theory of Freedom and Control. Academic Press, San Diego, CA.
ect many, if not most, authority-based appeals.	Burgoon, M., Alvaro, E., Grandpre, J. & Voulodakis, M. (2002). Revisting the theory of psychological reactance. In: Dillard, J.P. & Pfau, M. (Eds.). The Persuasion Handbook: Developments in Theory and Practice, 213–233. Sage, Thousand Oaks, CA.
xt five years	Europe's flexible office space to grow by up to 30% per year over next five years, says new JLL research. (2018). Retrieved from https://www.jll.co.uk/en/newsroom/europes-flexible-office-space-to-grow-up-to-30-percent-per-year-over-next-five-years

Item 47	Trend	Technological	1	The number of social media users worldwide will grow from 0.97 bil
Item 48	Trend	Economic	3	Total transactions for Europes five most prominent sharing economy accommodation, peer-to-peer transportation, on-demand household 20-fold increase to ¬570 billion by 2025, up from just ¬28 billion to
Item 49	Trend	Technological	4	Internet of Things (IoT) connected devices installed base worldwide 2025
Item 50	State	Economic	2	Dutch CEO's perceive over-regulation, populism and unstable geopo
Item 51	Principle	Sociological	9	Organisation that contain 150 people or less do not necessarily nee exceed that number will benefit from such structures (Laws, etc)
Item 52	Principle	Evolutionary	5	A common myth (religion, vision or alike) is need for strangers to suc certain goal.
Item 53	Trend	Sociological	4	Currently in the Netherlands people leave the house later than befo parents. In 2018 this number increased to 18%) This is because of st This trends is similar throughout Europe.
Item 54	Trend	Technological	5	In the Netherlands children get a mobile phone on an earlier age tha are 11.7 years old. 94% from all 12-year-old has a mobile phone.
Item 55	Principle	Psychological	5	Zero risk bias: People have the tendency to prefer zero risk options that have a greater risk reduction effect.
Item 56	Principle	Evolutionary	5	Well travelled road effect: People experience time slower when they
Item 57	Principle	Economic	4	Endowment-effect: People have the tendency to overvalue their pos
Item 58	Principle	Psychological	5	Information bias: People have the tendency to search for more infor
Item 59	Development	Economic	3	Personal mileage is estimated to rise by 23% by 2030 to 5.88 trillion
Item 60	Trend	Technological	5	By 2030 it is expected that Europe's vehicle inventory will reduce fr over 25%. For the US, we forecast a reduction of 22% to 212 million inventory there could grow by almost 50% in the same time period t
Item 61	State	Technological	8	In a theoretical 100% Robotaxi scenario, 14% of the existing invento demand – realistically, however, many more vehicles would need to

lion users in 2010 to 3.02 billion users in 2021.	Number of social media users worldwide 2010-2021. (2019). Retrieved from https://www.statista.com/statistics/278414/number-of-worldwide-social-network-users/
y sectors collaborative finance, peer-to-peer d services and on-demand professional services could see a day.	Europe's five key sharing economy sectors could deliver €570 billion by 2025. (2016). Retrieved from https://press.pwc.com/News-releases/europe-s-five-key-sharing-economy-sectors-could-deliver--570-billion-by-2025/s/45858e92-e1a7-4466-a011-a7f6b9bb488f
from grows from 15.41 billion devices in 2015 to 75.44 in	IoT: number of connected devices worldwide 2012-2025. (2019). Retrieved from https://www.statista.com/statistics/471264/iot-number-of-connected-devices-worldwide/
olitics as a threat to their organisational growth prospects.	PwC's 22nd Annual Global CEO Survey. (2019). Retrieved from https://www.pwc.com/gx/en/ceo-survey/2019/report/pwc-22nd-annual-global-ceo-survey.pdf
d organisational structures to function well. Organisation that	Harari, Y. (2015). Sapiens. London: Vintage.
ccessfully work together to complete a certain task or reach a	Harari, Y. (2015). Sapiens. London: Vintage.
re (in 2010 14% of 25 – 30-year-old persons lived at their tudy debts, unemployment and lack of suitable places to live.	Jongeren gaan steeds later ouderlijk huis uit. (2018). Retrieved from https://www.ad.nl/binnenland/jongeren-gaan-steeds-later-ouderlijk-huis-uit~a7885afb/
n before. Currently children get their first phone when they	van Gaalen, E. (2017). Honderden kleuters lopen al met een mobieltje op zak. Retrieved from https://www.ad.nl/binnenland/honderden-kleuters-lopen-al-met-een-mobieltje-op-zak~a6075052/
in situations they think important while there are options	Weusten, S. (2013). Zero risk bias: waarom we risico's willen uitsluiten. Retrieved from https://www.volkskrant.nl/nieuws-achtergrond/zero-risk-bias-waarom-we-risico-s-willen-uitsluiten~b9be825a/
y need to process more information.	Weusten, S. (2013). Well travelled road effect: waarom een bekende weg kort duurt. Retrieved from https://www.volkskrant.nl/nieuws-achtergrond/well-travelled-road-effect-waarom-een-bekende-weg-kort-duurt~bdd2d8a6/
ssession, because it hurts when they are getting rid of it.	Weusten, S. (2012). Pijn van het verlies is groter dan blijdschap van het verwerven. Retrieved from https://www.volkskrant.nl/nieuws-achtergrond/pijn-van-het-verlies-is-groter-dan-blijdschap-van-het-verwerven~b987f6a3/
mation, even if the information is irrelevant for the decision.	Weusten, S. (2012). Information bias: Waarom we blijven zoeken naar informatie. Retrieved from https://www.volkskrant.nl/nieuws-achtergrond/information-bias-waarom-we-blijven-zoeken-naar-informatie~bfb66bf3/
n kilometres in Europe.	Five trends transforming the Automotive Industry. (2019). Retrieved from https://www.pwc.com/gx/en/industries/automotive/assets/pwc-five-trends-transforming-the-automotive-industry.pdf
om 280 million to 200 million vehicles. This is a decrease of n vehicles. Due to the different market situation in China, the to 276 million vehicles, despite the higher utilisation.	Five trends transforming the Automotive Industry. (2019). Retrieved from https://www.pwc.com/gx/en/industries/automotive/assets/pwc-five-trends-transforming-the-automotive-industry.pdf
ory in the EU could be enough to satisfy the entire mobility be available to cover daily and seasonal demand peaks.	Five trends transforming the Automotive Industry. (2019). Retrieved from https://www.pwc.com/gx/en/industries/automotive/assets/pwc-five-trends-transforming-the-automotive-industry.pdf

Item 62	Trend	Technological	5	Over 55% of all new car sales could be fully electrified by 2030.
Item 63	State	Technological	4	The goal of the Dutch government is to provide all citizens access to speed of 100MB/s. Sometimes even 1 GB/s.
Item 64	Trend	Economic	4	The group of Dutch people that are 75 years or older and possess a cars per 100 persons in 2018. The mileage is also increasing in this g
Item 65	Trend	Biological	1	It is expected in 2040 that the group of Dutch people that are 60 ye Additionally, it is expected they live more years without disabilities c
Item 66	State	Sociological	5	Protecting the Nation from Foreign Terrorist Entry into the United S was an executive order by United States President Donald Trump. Th Chas, Somalia, Libya and Yemen. Additionally, people with a North-K are not welcome.
Item 67	State	Biological	7	Certain vaccinations are required when travelling from one country t
Item 68	Trend	Cultural	4	Vaccine hesitancy is considered a world health threat
Item 69	Principle	Cultural	1	All space exploration will be done with good intentions and is equall No one nation may claim ownership of outer space or any celestial b international law and the nations undergoing these said activities mu governmental agency involved. Objects launched into space are subj parts, and components discovered outside the jurisdiction of a natio object into space, they are responsible for any damages that occur in
Item 70	Trend	Economic	4	The net labor force participation rate has increased the last 10 years women (women 39.6% in 2008 till 58.8% in 2018; man 61,7% in 20
Item 71	Development	Cultural	6	More often, Dutch woman work the same amount of hours after giv
Item 72	Development	Economic	4	While in Dutch two-income households the man often is the breadw the breadwinner themselves. In two-income households with childre In 2016 this was already 17%. This is because woman more often ha
Item 73	Trend	Sociological	4	Dutch families drastically reduced in size between 1997 and 2007. F more. Orthodox Protestantism rather than foreign background plays large families. The number of families with four children, for example eight children dropped by no less than 41 percent.
Item 74	Trend	Cultural	3	In 2018 1.79 million Dutch inhabitants moved. This is 5% less compa started in 2014. Especially people younger than the age of 50 moved
Item 75	State	Cultural	6	In the Netherlands of the working woman 74% works par-time. This average 31% of the woman work par-time.

	Five trends transforming the Automotive Industry. (2019). Retrieved from https://www.pwc.com/gx/en/industries/automotive/assets/pwc-five-trends-transforming-the-automotive-industry.pdf
o fast broadband internet by 2023. This means a minimal	Olsthoorn, S. (2019). In dorpen twee keer glasvezel: 'Dit is wel kapitaalvernietiging ja'. Retrieved from https://fd.nl/ondernemen/1290314/in-dorpen-twee-keer-glasvezel-dit-is-wel-kapitaalvernietiging-ja
car is increasing. 303 cars per 1000 persons in 2006 to 437 group.	Autobezit 75-plussers neemt toe. (2018). Retrieved from https://www.cbs.nl/nl-nl/nieuws/2018/24/autobezit-75-plussers-neemt-toe
ars or older will live longer than current generation. or health issues.	Steeds langer leven zonder beperkingen. (2018). Retrieved from https://www.cbs.nl/nl-nl/nieuws/2018/12/steeds-langer-leven-zonder-beperkingen
tates, often referred to as the Muslim ban or the travel ban, his order states that people from the countries Iran, Syria, Korean nationality and government officials from Venezuela	Hoogste rechter VS staat inreisverbod Trump alsnog toe. (2017). Retrieved from https://www.rtlnieuws.nl/buitenland/artikel/3753911/hoogste-rechter-vs-staat-inreisverbod-trump-alsnog-toe
to another to protect yourself and another against diseases	GGD Reisvaccinaties. (2019). Retrieved from https://www.ggdreisvaccinaties.nl/
	Ten health issues WHO will tackle this year. (2019). Retrieved from https://www.who.int/emergencies/ten-threats-to-global-health-in-2019
y open to all States that comply with international law. body. Activities carried out in space must abide by the ust accept responsibility for the governmental or non-ject to their nation of belonging, including people. Objects, n will be returned upon identification. If a nation launches an nternationally.	The Declaration of Legal Principles Governing the Activities of States in the Exploration and Uses of Outer Space (1963)
s. It increased the most among 55 till 65 years old man and 08 till 76,6% in 2018).	Arbeidsdeelname naar leeftijd en geslacht. Retrieved from https://www.cbs.nl/nl-nl/visualisaties/dashboard-arbeidsmarkt/werkenden/toelichtingen/arbeidsdeelname-naar-leeftijd-en-geslacht
ing birth to their first child.	Portegijs, W. en M. van den Brakel (2016). Emancipatiemonitor 2016. Den Haag: Sociaal en Cultureel Planbureau / Centraal Bureau voor de Statistiek.
winner (respectively 80%) woman are becoming more often en woman 13% of the woman were the breadwinner in 2011. ave a bigger par time job than before and less small jobs.	Centraal Bureau voor de Statistiek. (2018). Financiële situatie van een- en tweeverdieners.
Families with a non-western background reduced in size even the most important part in the regional distribution of very e, dropped by 8 percent, whereas the number of families with	Steeds minder zeer grote gezinnen. (2008). Retrieved from https://www.cbs.nl/nl-nl/nieuws/2008/20/steeds-minder-zeer-grote-gezinnen
ared to 2017. It marks the end of an upward trend that d less.	Minder verhuizingen in 2018. (2019). Retrieved from https://www.cbs.nl/nl-nl/nieuws/2019/09/minder-verhuizingen-in-2018
is a lot more compared to other EU countries were on	Emancipatiemonitor: economische positie van vrouwen verbeterd. (2018). Retrieved from https://www.cbs.nl/nl-nl/nieuws/2018/50/emancipatiemonitor-economische-positie-van-vrouwen-verbeterd

Item 76	Trend	Cultural	6	In the Netherlands traditional family roles are slowly decreasing
Item 77	Trend	Cultural	7	Dutch people are less often married. In 1950 the Netherlands count At the same time, registered partnership is on the rise, with 4,6 thou towards 17,9 thousand registrations in 2017. It has become custom time first before getting married or to continue as unmarried couple
Item 78	State	Demographic	4	Net migration (immigration minus emigration) always fluctuates shar has varied between −48 thousand (1952) and +80 thousand (2016 a migration the most.
Item 79	Principle	Sociological	1	By measuring the entropy of each individual's trajectory, a 93% pote base. Despite the significant differences in the travel patterns, a rem which is largely independent of the distance users cover on a regular
Item 80	Trend	Cultural	6	More children are going to a formal day-care organization. It raised 2016 (+43%). At the same time the number of total day-care locatio care that facilitates day-care for a broader varity of children.
Item 81	Principle	Technological	8	Finnish women and people living in essentially urban areas are more small-sized digital mobilities than men and people living in rural loca
Item 82	State	Sociological	4	Finnish young people and students are more likely to benefit from th with a larger variety of mobility means than older people and pensio
Item 83	State	Technological	6	Combined use of corporeal and digital means of mobility affect the s
Item 84	Trend	Sociological	3	Dutch divorces increased with 3% from 5% in 2000 to 8% in 2017
Item 85	Development	Cultural	5	One century almost everybody in the Netherlands went to church. T religious denomination has been decreasing ever since. It decreased visits declined from 23% in 2000 to 16% in 2015.
Item 86	State	Sociological	6	Since 2000 almost 85% of the Dutch people have daily or weekly co personal meeting. The share of daily or weekly contact with neighbo numbers have been stable ever since.
Item 87	State	Sociological	1	People with relative much social contact experience more "benefits" with weak social networks, the internet offers little or no compensat

	Cooper, G. (1997). Traditional family roles increasingly eroded. Retrieved from https://www.independent.co.uk/news/traditional-family-roles-increasingly-eroded-1272076.html & Hoffman, L. (1977). Changes in family roles, socialization, and sex differences. American Psychologist, 32(8), 644-657. doi: 10.1037//0003-066x.32.8.644
ed 83,1 thousand couples. In 2017 this was 64,4 thousand. usand couples signing a registered partnership in 1998, ary among younger generations to live together for some s altogether.	Twintigers en dertigers trouwen minder. (2018). Retrieved from https://www.cbs.nl/nl-nl/nieuws/2018/18/twintigers-en-dertigers-trouwen-minder
rply. Since the middle of last century, the migration balance and 2017). Political and economic factors affect the net	Recordaantal immigranten en emigranten in 2017. (2018). Retrieved from https://www.cbs.nl/nl-nl/nieuws/2018/42/recordaantal-immigranten-en-emigranten-in-2017
ential predictability in user mobility across the whole user arkable lack of variability has been found in predictability, r basis.	Song, C., Qu, Z., Blumm, N., & Barabasi, A. (2010). Limits of Predictability in Human Mobility. Science, 327(5968), 1018-1021. doi: 10.1126/science.1177170
from 573 thousand children in 2007 to 823 thousand in ns is declining and is moving to more integral forms of day-	Kinderopvang, cijfers en trends. (2017). Retrieved from https://www.rabobank.nl/bedrijven/cijfers-en-trends/dienstverlening/kinderopvang/ & Toename 59 duizend kinderen met kinderopvangtoeslag. (2017). Retrieved from https://www.cbs.nl/nl-nl/nieuws/2017/23/toename-59-duizend-kinderen-met-kinderopvangtoeslag
likely to augment their physical travelling practices by using tions.	Taipale, S. (2014). The dimensions of mobilities: The spatial relationships between corporeal and digital mobilities. Social Science Research, 43, 157-167. doi: 10.1016/j.ssresearch.2013.10.003
heir mobility in networking activities as they are equipped ners	Taipale, S. (2014). The dimensions of mobilities: The spatial relationships between corporeal and digital mobilities. Social Science Research, 43, 157-167. doi: 10.1016/j.ssresearch.2013.10.003
spatial organisation of mobilities only little in Finland	Taipale, S. (2014). The dimensions of mobilities: The spatial relationships between corporeal and digital mobilities. Social Science Research, 43, 157-167. doi: 10.1016/j.ssresearch.2013.10.003
	Worden we individualistischer?. (2017). Retrieved from https://www.cbs.nl/nl-nl/nieuws/2017/52/worden-we-individualistischer-
The from 60% to 50% between 2000 and 2015. Also the actual	Worden we individualistischer?. (2017). Retrieved from https://www.cbs.nl/nl-nl/nieuws/2017/52/worden-we-individualistischer-
ntact with family members via phone, social media or rs (61%), friends and acquaintances (77%) is lower. These	Worden we individualistischer?. (2017). Retrieved from https://www.cbs.nl/nl-nl/nieuws/2017/52/worden-we-individualistischer-
from their social digital activities then others. For people tion.	Worden we individualistischer?. (2017). Retrieved from https://www.cbs.nl/nl-nl/nieuws/2017/52/worden-we-individualistischer-

Item 88	Trend	Technological	4	Internet has become an important tool to find a partner. Of all coupl less than 2% met each other via internet. This became 10% five year The increase of internet usage in the relationships market was the m the first time the most during a leisure activity (going out, holiday e these numbers are declining.
Item 89	State	Sociological	3	Almost 4% of the Dutch from 15 years old did not have weekly cont 2015. People between 45- and 75-years old lack these kinds of cont stable the last 4 years.
Item 90	Principle	Evolutionary	7	Instant gratification: People have the nature that when they want so
Item 91	State	Economic	4	Savings interests are historically low in the EU. This is because the E rents leads to people and organisation spending money instead of sa
Item 92	State	Economic	2	There are yearly half million flight movements around Schiphol Airpo movements is not allowed to be raised till 2020.
Item 93	State	Cultural	3	Leisure has historically been the privilege of the upper-class. Opport and less working time, rising dramatically in the mid to late 19th cen nations in Europe
Item 94	Principle	Evolutionary	1	Time available for leisure varies from one society to the next, althou have significantly more leisure time than people in more complex so
Item 95	Principle	Evolutionary	5	Leisure is important across the lifespan and can facilitate a sense of from physical, social, emotional, cultural, and spiritual aspects of leis
Item 96	State	Cultural	1	In 2017 travelling by car was the most preferred way to get to a sum almost 90 percent of domestic holidays. Cars were also most freque followed by airplanes (43 percent).
Item 97	State	Cultural	2	Of all summer holidays in 2017, 19 percent of the stays were booke one day to a week before departure. Over 20 percent had booked th while 7 percent had organised this even sooner. For nearly 14 perce at all. This mainly concerns holidays where people stay in their own permanent camping pitch for their caravan or tent.
Item 98	Principle	Biological	8	Emergence is the spontaneous creation of sophisticated behaviours fish moving in a school, frozen water molecules being part of a snow
Item 99	Development	Cultural	1	Brexit: The United Kingdom is leaving the European Union on 29th Euroscpetics
Item 100	State	Biological	2	By 2020 10% of the fuel used in transport should be from a renewal
Item 101	Development	Economic	1	By 2030, the Dutch government prohibits selling fossil fuelled cars.
Item 102	Trend	Biological	4	Obesity among people that are 20 years or older have been increasi Compared to other countries in the EU, Netherlands is the third low

es that were going to live together between 1998 and 2003, rs later. It raised further to 13% between 2008 and 2013. nost among people over 40. Still couples meet each other for tc.), via friends, acquaintances neighbours or work. However,	Worden we individualistischer?. (2017). Retrieved from https://www.cbs.nl/nl-nl/nieuws/2017/52/worden-we-individualistischer-
act with family, friends or neighbors between 2012 and tacts more. The total number of Dutch in isolation has been	Worden we individualistischer?. (2017). Retrieved from https://www.cbs.nl/nl-nl/nieuws/2017/52/worden-we-individualistischer-
omething they want to have it as soon as possible.	Jeekel, H. (2019). Waarom kunnen we niet zonder mobiliteit?. Retrieved from https://www.verkeerinbeeld.nl/blog/120219/waarom-kunnen-we-niet-zonder-mobiliteit
CB wants to give the European Economy and impulse. Low aving it.	Waarom is de spaarrente zo laag?. Retrieved from https://www.ing.nl/de-ing/achtergronden/economie/waarom-is-de-spaarrente-zo-laag.html
ort. The Dutch government decided that the number of	Meerderheid wil einde aan groei Schiphol: "Het wordt gewoon te gek". (2018). Retrieved from https://www.nhnieuws.nl/nieuws/226621/nh-panel-schiphol-mag-niet-verder-groeien
tunities for leisure came with more money, or organization, tury, starting in Great Britain and spreading to other rich	Peter N. Stearns, ed., Encyclopedia of European social history from 1350 to 2000 (2001) 5:3-261.
gh anthropologists have found that hunter-gatherers tend to cieties.	Just, P. (1980). Time and Leisure in the Elaboration of Culture. Journal of Anthropological Research, 36(1), 105-115. doi:10.1086/jar.36.1.3629555
control and self-worth. Older adults, specifically, can benefit ure.	Kleiber, D. A., Walker, G. J., & Mannell, R. C. (2011). A social psychology of leisure. Venture Pub., Incorporated.
mer destination. This type of transport was used for ntly chosen for summer holidays abroad (48 percent),	Twee derde zomervakanties geboekt via internet. (2018). Retrieved from https://www.cbs.nl/nl-nl/nieuws/2018/30/twee-derde-zomervakanties-geboekt-via-internet
d only after departure from home; in 8 percent of the cases heir holiday stay three to six months before departure nt of summer holidays, no lodging arrangements were made accommodation (a summer house, for example) or have a	Twee derde zomervakanties geboekt via internet. (2018). Retrieved from https://www.cbs.nl/nl-nl/nieuws/2018/30/twee-derde-zomervakanties-geboekt-via-internet
and functions from large groups of simple elements. Think of flake.	S. Jacobs, N. (2019). How do schools of fish swim in harmony? - Nathan S. Jacobs. Retrieved from https://ed.ted.com/lessons/how-do-schools-of-fish-swim-in-harmony-nathan-s-jacobs#review
of March 2019. The Brexit has been advocated by	, From & Gifford, Chris. (2014). THE MAKING OF EUROSCEPTIC BRITAIN.
ble source.	Centraal Bureau voor de Statistiek. (2016). Transport en Mobiliteit 2016 [Ebook]. Den Haag. Retrieved from https://www.cbs.nl/-/media/_pdf/2016/25/tm2016_web.pdf
	van de Weijer, B. (2019). Betekent de opkomst van de elektrische auto het einde voor het garagebedrijf?. De Volkskrant. Retrieved from https://www.volkskrant.nl/nieuws-achtergrond/betekent-de-opkomst-van-de-elektrische-auto-het-einde-voor-het-garagebedrijf-~b7445a50/
ng in the Netherlands from 5,5% in 1981 to 14.2% in 2017. est country with respect to obesity rate.	100 duizend volwassenen hebben morbide obesitas. (2018). Retrieved from https://www.cbs.nl/nl-nl/nieuws/2018/27/100-duizend-volwassenen-hebben-morbide-obesitas &

Item 103	State	Cultural	5	From March 1st 2019 the Dutch police is allowed to hack suspects t minimal 4 years of jail-time.
Item 104	Development	Technological	6	The first robot-controlled operation has been conducted in Barcelon
Item 105	Development	Technological	8	Volvo will reduce the maximum speed of newly released cars from 2 accidents.
Item 106	Development	Technological	7	ICT, robots and artificial intelligence play a more important role in ec having fundamental technical knowledge becomes increasingly valua
Item 107	Development	Technological	7	The Dutch government is using more complex models, based on adv does predications with these models based on data of citizens.
Item 108	Trend	Economic	5	Baumol's cost disease states that in the last two centuries agricultur This results in services, like ballet, became more expensive compare more need for contact, recognition and self-realization, according to people's basic needs.
Item 109	Development	Technological	4	PSD2 is a new European guideline for payment services. It allows ba payment market.
Item 110	Trend	Economic	1	In recent decades, income inequality has increased in nearly all coun policies matter in shaping inequality
Item 111	Development	Cultural	1	Based on the findings of two population projection reports, the gove between 44.2 and 49.9 per cent) could be an immigrant or the child
Item 112	Principle	Biological	4	Higher speeds cause people to travel further, not shorter.
Item 113	Principle	Evolutionary	1	Instant (or immediate) gratification is a term that refers to the tempt order to obtain a less rewarding but more immediate benefit. At the inherent in humans—the tendency to see pleasure and avoid pain. Th The flip side of instant gratification is delayed gratification, or the de even better reward or benefit in the future. It's easy to see how dela struggle on a daily basis with the temptation to give in to our immed
Item 114	Development	Cultural	1	The Dutch take more often the plane when going on holiday to a for 2016. The car is still the most popular means of transport when goir
Item 115	State	Cultural	1	Range anxiety. The fear of being stranded in an electric car because sales of electric vehicles.
Item 116	Principle	Evolutionary	4	Kill-the-winner principle. Natural enemies like, diseases strike more can fulfill this role in modern societies.

hat are accused of acts of criminality that could lead to	Politie mag per 1 maart verdachten zware misdrijven hacken. (2019). Retrieved from https://www.nu.nl/internet/5765715/politie-mag-per-1-maart-verdachten-zware-misdrijven-hacken.html
a via a 5G network in February 2019.	Het Financieele Dagblad. (2019). Eerste operatie via 5G een feit.
020 to 180 km/u. They do this to reduce the risk of fatal	Volvo verlaagt maximale snelheid nieuwe auto's naar 180 kilometer per uur. (2019). Retrieved from https://www.nu.nl/auto/5772585/volvo-verlaagt-maximale-snelheid-nieuwe-autos-naar-180-kilometer-per-uur.html
conomic activity, society and our way of communication. Also able in political decisions.	Putters, K. (2019). Nederland moet imago en toegankelijkheid van het techniekonderwijs snel verbeteren. Het Finacieele Dagblad, p. 30.
vanced algorithms. The government makes decisions and	Verbeek, W. (2019). Niemand weet straks nog waarom de overheid een besluit neemt. Het Financieel Dagblad, p. 31.
e and industry became more productive and services not. d to goods. However, it can be argued that people will have the Maslow's Hierarchy, if goods more efficient satisfy	Lukkezen, J. (2019). Straks is iedereen artiest of adviseur. Het Financieele Dagblad, p. 4. Retrieved from https://fd.nl/futures/1290742/straks-is-iedereen-artiest-adviseur-of-verpleger
nks to share payment data and creates one European	Zuurmond, I. (2019). PSD2: Europese richtlijn voor betaaldiensten. Retrieved from https://www.consumentenbond.nl/betaalrekening/psd2
tries, but at different speeds, suggesting that institutions and	The World Inequality Lab. (2018). The World Inequality Report 2018. Retrieved from https://wir2018.wid.world/
ernment agency projects that nearly one in two Canadians (or of an immigrant by 2036.	Dunham, J. (2019). Nearly half of Canadians will be immigrants, children of immigrants by 2036: StatsCan. Retrieved from https://www.ctvnews.ca/canada/nearly-half-of-canadians-will-be-immigrants-children-of-immigrants-by-2036-statscan-1.3256361
	van de Weijer, C. (2019). Maximaal 120 op weg én spoor. Het Financieele Dagblad, p. 26. Retrieved from https://fd.nl/futures/1290751/het-onrecht-van-snelheid
ation, and resulting tendency, to forego a future benefit in heart of instant gratification is one of the most basic drives his tendency is known as the pleasure principle. ecision to put off satisfying your desire in order to gain an yed gratification is generally the wiser behavior, but we still diate desires.	Ackerman, C. (2018). What is Instant Gratification? A Definition + 16 Examples and Quotes. Retrieved from https://positivepsychologyprogram.com/instant-gratification/#what-instant-gratification
reign country. It increased from 16,5 % in 1990 to 38% in g abroad.	Vakanties van Nederlanders, 1990-2016. (2017). Retrieved from https://www.clo.nl/indicatoren/nl0039-deelname-aan-vakanties
of insufficient battery performance – said to be a barrier to	Range Anxiety. (2009). Retrieved from https://schott.blogs.nytimes.com/2009/01/15/range-anxiety/ & Melliger, M., van Vliet, O., & Liimatainen, H. (2018). Anxiety vs reality – Sufficiency of battery electric vehicle range in Switzerland and Finland. Transportation Research Part D: Transport And Environment, 65, 101-115. doi: 10.1016/j.trd.2018.08.011
than average the dominant species. Only (natural) disasters	van Bavel, B. (2018). Wereldwijde ongelijkheid groeit: is er een oplossing?. Retrieved from https://www.uu.nl/nieuws/wereldwijde-ongelijkheid-groeit-is-er-een-oplossing

Item 117	Principle	Psychological	6	Reciprocity and balance in social relations have been fundamental to human brain has become specialized by natural selection to compute thinking also on the issues of environmental impact. This balancing h footprint illusions—the misconceptions that "green" choices can com in the moral environmental account may promote pro-environmenta in reality more harmful than doing nothing at all.
Item 118	Development	Cultural	5	The European Commission adopted a long-term strategy to deliver s will drive this transition through targeted legislation and supporting innovation. This will ensure that the best clean, connected and auton will be developed, offered and manufactured in Europe.
Item 119	State	Sociological	3	In the US, only 2% of traffic is public transport. The half of this come
Item 120	Trend	Demographic	1	The world population will increase with 1 billion people by 2025. Th India.
Item 121	Trend	Economic	1	The global economic power will shift from the G7 towards the E-7 c Turkey)
Item 122	Trend	Cultural	3	Dalhousie University and the University of Guelph have said that, in their food budgets on takeout and prepared foods.
Item 123	Trend	Cultural	1	Dutch use the internet more often to call and watch television. In 20 via internet. In 2018 this was already 50%. 72% of the people watch Youtube. A little more than the half watch on demand series and mo movies on demand. This is the same for music streaming services.
Item 124	Development	Technological	4	5G is the latest generation of cellular mobile communications. 5G is devices at the same time. It is believed that these factors are necess more inventions come true.
Item 125	Principle	Biological	8	Trampling studies have consistently documented that impacts on soi As few as 15 passages over a site can be enough to create a distinct
Item 126	Trend	Biological	1	For the third year in a row, there has been a rise in world hunger. The facing chronic food deprivation, has increased to nearly 821 million from almost a decade ago.
Item 127	Trend	Economic	2	In November 2018, for the first time in 10 years the European unem
Item 128	State	Technological	6	Facebook (and related services like WhatsApp and Instagram) annou This translates into private interactions, encryptions, reducing perma
Item 129	State	Sociological	7	In developed (Northern-European) countries about 9% to 11% of ho 7% of all households is at risk because of a poor transport system (a another 2% to 4% is at risk of accessibility poverty because of dispro Western societies have well-established policies regarding the fair p groups. In contrast, decision-makers have not even started to define

o social cooperation, and thus to survival, and therefore the e and seek this balance. However, people apply this way of neuristic leads to compensatory green beliefs and negative npensate for unsustainable ones. “Eco-guilt” from imbalance l acts, but also acts that are seemingly pro-environmental but	Sörqvist, P., & Langeborg, L. (2019). Why People Harm the Environment Although They Try to Treat It Well: An Evolutionary-Cognitive Perspective on Climate Compensation. Frontiers in Psychology, 10. doi:10.3389/fpsyg.2019.00348
smart, socially fair and competitive mobility by 2025. The EU measures, including infrastructure investment, research and mated mobility solutions, transport equipment and vehicles	European Commission. (2017). Europe on the Move: Commission takes action for clean, competitive and connected mobility.
es from the metro in New York.	Broekhuizen, K. (2019). Uber stapt na auto en fiets nu ook in openbaar vervoer. Retrieved from https://fd.nl/achtergrond/1291207/uber-stapt-na-auto-en-fiets-nu-ook-in-openbaar-vervoer
is grow will shift from Europe and East-Asia to Africa and	Demografische veranderingen. (2019). Retrieved from https://www.pwc.nl/nl/themas/megatrends/demografie.html
ountries. (China, India, Brazil, Mexico, Russia, Indonesia and	Verschuiving in economische macht. (2019). Retrieved from https://www.pwc.nl/nl/themas/megatrends/economie.html
fewer than twenty years, Canadians may be spending half of	Nuttall-Smith, C., Moyles, T., Pollon, C., & Waltner-Toews, D. (2019). The Future of Food | The Walrus. Retrieved from https://thewalrus.ca/the-future-of-food/
012 23% of the people that were 12 year or older called ed video’s and movies via a video sharing service such as vies. 75% People from 12 till 25 years watched series and	Bellen en televisiekijken via internet toegenomen. (2018). Retrieved from https://www.cbs.nl/nl-nl/nieuws/2018/44/bellen-en-televisiekijken-via-internet-toegenomen
faster, has lower latency and the ability to connect more ary to make driverless cars, the internet of things and many	Segan, S. (2019). What Is 5G?. Retrieved from https://www.pcmag.com/article/345387/what-is-5g
il and vegetation occur rapidly with initial use of desire paths. trail, the existence of which then attracts further use.	Hampton, B., & Cole, D. (1991). Soft paths. Harrisburg, PA: Stackpole Books.
e absolute number of undernourished people, i.e. those in 2017, from around 804 million in 2016. These are levels	SOFI 2018 - The State of Food Security and Nutrition in the World. (2018). Retrieved from http://www.fao.org/state-of-food-security-nutrition/en/
ployment rate (19 countries) was under 8%.	Werkloosheid in Europa verder omlaag. (2019). Retrieved from https://fd.nl/economie-politiek/1284888/werkloosheid-in-europa-verder-omlaag
nced that privacy will their main focus for the coming years. anence, safety interoperability and secure data storage.	Zuckerberg, M. (2019). A Privacy-Focused Vision for Social Networking [Blog]. Retrieved from https://www.facebook.com/notes/mark-zuckerberg/a-privacy-focused-vision-for-social-networking/10156700570096634/
useholds is at risk of accessibility poverty. Of this group, nd sometimes also because of affordability problems), while portionally high motoring costs. We observe that most rovision of health care, education and housing for all (income) what fairness in the domain of transport could amount to.	Jeekel, J., & Martens, C. (2017). Equity in transport: Learning from the policy domains of housing, health care and education. European Transport Research Review, 9(4). doi: 10.1007/s12544-017-0269-1

Item 130	State	Cultural	3	In Netherlands space is divided into mono-functional zones for work considerable distances when moving from one area to another.
Item 131	Trend	Cultural	1	Almost 80% of the Dutch that are 17 years or older have their drivin Dutch persons have the personal car driving license B. That is 1% m
Item 132	State	Sociological	4	Many activities are in modern society not or almost not possible wit car.
Item 133	State	Demographic	7	A decline of people living in a certain area causes irradiation of level
Item 134	State	Demographic	6	In certain Dutch rural areas, demographic decline caused an increase transport.
Item 135	State	Cultural	1	Places that are less accessible are called 'no spots' and have a lower accessible.
Item 136	State	Cultural	4	When people need more care, they also become more transport dep become also more important.
Item 137	State	Cultural	2	In 2016 the average distance from a Dutch home to the doctor was
Item 138	Trend	Economic	6	The worldwide food delivery market grew a lot last years and is expe million dollar in 2017 to 82,221 million dollar in 2018 (+16,46%). It i (+63,57%).
Item 139	Trend	Sociological	3	The number of state-based armed conflicts in the world declined sli active in 31% of them. The number of non-state conflicts increased and non-state conflicts continue to represent major threats to reduc
Item 140	Development	Cultural	6	Increased airport security is one of the effects of the 9/11 terrorist a Administration and The Department of Homeland Security in the US

king, living and recreation. The Dutch need to bridge these	Jeekel, H. (2019). Waarom kunnen we niet zonder mobiliteit? [Blog]. Retrieved from https://www.verkeerinbeeld.nl/blog/120219/waarom-kunnen-we-niet-zonder-mobiliteit
g license. At the beginning of 2019 almost 11,2 million ore compared to last year.	Kerssies, J. (2019). Bijna 80 procent volwassen Nederlanders heeft een rijbewijs. Retrieved from https://www.verkeerinbeeld.nl/nieuws/010319/bijna-80-procent-volwassen-nederlanders-heeft-een-rijbewijs
hout a car. These activities are partly made possible by the	Jeekel, H. (2011). De autoafhankelijke samenleving. Proefschrift, Erasmus Universiteit Rotterdam. Delft: Eburon.
of services. Shops and schools disappear when people leave.	Bijl, R. (2009), Sociale samenhang en bevolkingskrimp. Demos, 25(7), 8. https://www.nidi.nl/shared/content/demos/2009/demos-25-07.pdf
e in car usage. That leads to reduced support for public	Meert, H., Bourgeois, M., Hoof, K. van & Asperges, T. (2003). Immobiel op het platteland; Omtrent rurale vervoersarmoede in Vlaanderen. Koning Boudewijnstichting, Brussel. http://docplayer.nl/752197-Immobiel-op-hetplatteland-omtrent-rurale-vervoersarmoede-in-vlaanderen.html Platform 31& ZB Planbureau. (2017). Mobiliteit in dunbevolkte regio's: Over vervoersarmoede, mobiliteit en bereikbaarheid. https://www.platform31.nl/publicaties/mobiliteit-in-dunbevolkte-regio-s
status compared to places in which residents are mobile and	Platform 31& ZB Planbureau. (2017). Mobiliteit in dunbevolkte regio's: Over vervoersarmoede, mobiliteit en bereikbaarheid. https://www.platform31.nl/publicaties/mobiliteit-in-dunbevolkte-regio-s
pendent. At the same time accessibility of destinations	Mobiel 21, 2015 Dossier vervoersarmoede vandaag, De rol van mobiliteit in de sociale uitsluiting van mensen in armoede in Vlaanderen. Geraadpleegd op 15-10- 2018. https://www.mobiel21.be/assets/documents/Dossier-Vervoersarmoedevandaag.pdf
1 KM and supermarket 800 M.	CBS (2018e), Statline: Nabijheid voorzieningen; afstand locatie, regionale cijfers. Geraadpleegd op 21-9-2018: http://opendata.cbs.nl/statline/#/CBS/nl/dataset/80305ned/table?ts=153311732570 1
ected to grow a lot more in the future. It grew from 70,598 s expected to grow to 134.490 million dollar in 2023	Online Food Delivery - worldwide. (2019). Retrieved from https://www.statista.com/outlook/374/100/online-food-delivery/worldwide?currency=usd
ghtly from 53 in 2016 to 49 in 2017, with the Islamic State from 62 in 2016 to 82 in 2017. Internationalised conflicts ctions in violence.	Peace Research Institute Oslo. (2018). Trends in Armed Conflict, 1946–2017. Oslo. Retrieved from https://reliefweb.int/report/world/trends-armed-conflict-1946-2017
attacks. The creation of The Transportation Security SA is a direct result of these attacks.	Udice, K. (2018). 10 ways the world changed after the 9/11 attacks. Retrieved from https://www.thisisinsider.com/world-changed-after-september-11-2018-9#2-airport-security-has-gotten-a-lot-stricter-2

Item 141	Trend	Sociological	6	As a response on the 9/11 attacks, the Bush administration ramped roughly a 400% increase in criminal deportations in the USA. It's imp charged with a crime, they were not necessarily convicted of one.
Item 142	Trend	Sociological	5	The number of assaults against Muslims in the United States rose sig easily surpassing the modern peak reached in 2001 (93 crimes), the
Item 143	State	Cultural	4	Accommodations of Dutch holidays in 2017 were booked after depa
Item 144	Development	Demographic	1	The number of road traffic deaths continues to rise steadily, reachin the size of the world's population has remained constant.
Item 145	Trend	Economic	1	Worldwide, the time required to legally start a business declined fro
Item 146	Trend	Cultural	1	As of the end of 2016, 97 out of 167 countries (58%) with populatio were autocracies, both post-World War II records. The rest either ex were not rated. Broadly speaking, the share of democracies among t the mid-1970s.
Item 147	Trend	Cultural	3	68.5 million people were forcibly displaced in 2017. The past decade forcibly displaced people. In 2007, this population numbered 42.7 m 50 per cent. Today 1 out of every 110 people in the world is displace
Item 148	Principle	Psychological	5	That people evaluate themselves more favourably than their average effect (BTAE) – is one of the most frequently cited instances of moti
Item 149	Trend	Cultural	5	There has been significant increase in blocking and filtering of shutdowns of entire social media websites, mobile networks residents in 131 countries across all regions have suggested tha freedoms across many countries. At the same time, however, media the world.
Item 150	Development	Cultural	4	Media independence is under increased pressure, due to con and regulatory authorities, attempts to influence or de-legitimiz organizations.
Item 151	Development	Cultural	4	The Dutch changed their opinion when it is about criminal law enfor renegades that need to be helped back on track. Today's criminals ar in life imprisonment then in the whole 20th century.
Item 152	Trend	Biological	3	In 2017 the Netherlands total energy usage was 157 PJ. 41% of this consists out of renewable energy, nuclear energy and waste. Howev last year.
Item 153	Development	Cultural	1	Besides the Netherlands, France, Belgium and Germany are depende extraction have different economic and social consequence for thes

up deportation efforts. From 2001 to 2012, there was portant to note that while most of the people deported were	Udice, K. (2018). 10 ways the world changed after the 9/11 attacks. Retrieved from https://www.thisisinsider.com/world-changed-after-september-11-2018-9#2-airport-security-has-gotten-a-lot-stricter-2
gnificantly between 2015 (91 crimes) and 2016 (127 crimes), year of the September 11 terrorist attacks.	Kishi, K. (2017). Assaults against Muslims in U.S. surpass 2001 level. Retrieved from http://www.pewresearch.org/fact-tank/2017/11/15/assaults-against-muslims-in-u-s-surpass-2001-level/
arture 19% of the time.	Twee derde zomervakanties geboekt via internet. (2018). Retrieved from https://www.cbs.nl/nl-nl/nieuws/2018/30/twee-derde-zomervakanties-geboekt-via-internet
g 1.35 million in 2016. However, the rate of death relative to	Global status report on road safety 2018: summary. Geneva: World Health Organization; 2018 (WHO/NMH/NVI/18.20). Licence: CC BY-NC-SA 3.0 IGO)
m 52 in 2003 to 20 in 2018	Time required to start a business (days). (2018). Retrieved from https://data.worldbank.org/indicator/IC.REG.DURS?end=2018&start=2018&view=bar
ons of at least 500,000 were democracies, and only 21 (13%) xhibited elements of both democracy and autocracy (26%) or he world's governments has been on an upward trend since	DeSilver, D. (2017). Nearly six-in-ten countries are now democracies. Retrieved from http://www.pewresearch.org/fact-tank/2017/12/06/despite-concerns-about-global-democracy-nearly-six-in-ten-countries-are-now-democratic/
e has seen substantial growth in the global population of illion; over the last 10 years, this figure has increased by over ed, compared with 1 in 157 a decade ago.	UNHCR. (2018). Forced Displacement in 2017. Retrieved from https://www.unhcr.org/statistics/unhcrstats/5b27be547/unhcr-global-trends-2017.html
e peer on desirable characteristics – the better-than-average vated self-enhancement.	Sedikides, C., Meek, R., Alicke, M., & Taylor, S. (2013). Behind bars but above the bar: Prisoners consider themselves more prosocial than non-prisoners. British Journal Of Social Psychology, 53(2), 396-403. doi: 10.1111/bjso.12060
online content and a rising trend of large-scale or national internet access. Recent Gallup polls of at there is a general perception of declining media freedom remains recognized and valued by people around	UNESCO. (2017). World trends in freedom of expression and media development: global report 2017/2018. Retrieved from https://unesdoc.unesco.org/ark:/48223/pf0000261065
mplex interconnections between political power ze media and journalists, and shrinking budgets in news	UNESCO. (2017). World trends in freedom of expression and media development: global report 2017/2018. Retrieved from https://unesdoc.unesco.org/ark:/48223/pf0000261065
rcement. In the 70's criminals were seen as re seen are pure evil. At this moment there are more people	van Walsum, S. (2019). Op vergiffenis hoeft IS-strijder Yago R. in Nederland niet te rekenen. Retrieved from https://www.volkskrant.nl/columns-opinie/op-vergiffenis-hoeft-is-strijder-yago-r-in-nederland-niet-te-rekenen~b2e2c34d/
was natural gas, 39% natural oil, 12% coal. The last 8% er, the share of renewable energy grew 10% compared with	Energie - Cijfers - Economie. (2018). Retrieved from https://longreads.cbs.nl/trends18/economie/cijfers/energie/
ent on natural gas extraction in Groningen. Stopping with the e regions.	Einde aan gaswinning in Groningen, hoe gaat dat in z'n werk? | NU - Het laatste nieuws het eerst op NU.nl. (2018). Retrieved from https://www.nu.nl/weekend/5199548/einde-gaswinning-in-groningen-gaat-in-zn-werk.html

B Clustering

Clustering the found context factors in to smaller groups is the first step in creating the future context. This is necessary, because it reduces complexity, allowing me to start seeing the context as a whole.

In essence, there are two types of clusters; Common-quality clusters and Emergent-quality clusters. The first cluster type is a combination of context factors that all point in the same direction. The second cluster type can be created by combining various context factors to create a new insight that is not communicated by one of the factors.

The clusters were created by first printing all the context factors on individual businesscard- sized cards. Afte which I started with grouping them by placing them (in random order) on A3 papers. A title for the potential found cluster was written on the A3 paper if more than two cards were placed on one A3 paper. The aim was to have not more than 15 clusters, as more than 15 clusters would not have reduced the complexity and variety enough to be able to properly work with the factors. The least number of clusters is preferred only if there is enough unity, variety and richness of the individual factors is preserved.

In the end nine clusters among the found 148 context factors were identified. Five context factors were not used in the end as it turned out that they were not relevant in the mobility domain. The clusters are:

1. **Living in Bubbles**
2. **Infinite trust in black box systems**
3. **Mainstream becomes the norm**
4. **Defending your autonomy**
5. **Unequal chances in life**
6. **Hypermarket Differentiation**
7. **Being digital literate as a requirement to be part of society**
8. **Occupied with creating the better self instead of living the moment**
9. **People do not take personal responsibility for a better world**

C Context structuring

The context is about finding the hidden thread between the nine different clusters. Just like clustering, determining the relationships between the clusters is necessary to reduces complexity, allowing me to start seeing hidden patterns among these clusters.

Similar to the context factors, in essence there are two ways in which a coherent structure of clusters can be created. One way of creating a coherent structure of context factors is to look for a pattern. This pattern should reveal the hidden narrative among the identified clusters. The other way is called dimensions. In this method, clusters that are each other opposites, or conflict with each other, are placed on one or more axis of a reference frame with clear conceptually and clearly defined axis. The challenge with both methods, or any other way that enables you to tell create a coherent structure, is to choose the correct method that enables you preserve the information richness of your clusters. Choosing the wrong approach can easily result in oversimplifying the subtle differences between clusters (and their factors) or making things too complex to work with. Just like clustering, it is important to find this balance to be effective while discovering the hidden narrative.

For this project I came to the conclusion that a two-dimensional frame of reference with one cluster conflict worked the best with the clusters that I have (Figure 4220 & Figure 445). After some iterations based around the common two-dimensional frame of reference with a two-cluster conflict (Figure 43), I came to the conclusion that I lost to much contextual richness. I was oversimplifying the complexity of society related to mobility with the common two-dimensional frame of reference (Figure 43). To overcome this problem I decide to make use of another frame of reference named the two-axis (Figure 10 & Figure 1135). In this frame of reference two driving forces of my future society related to the mobility domain are placed on both axis. I identified that these determinants, or driving forces, are *Occupied with creating the better self instead of living in the moment (cluster 8)* and *People do not take personal responsibility for a better world (cluster 9)*.

D Vision Statement format

The following elements are essential for usable statement within the ViP process.

I, (the designer), or we, (the company), want people to X (desired effect) by (mechanism)

A couple of things are important when defining a ViP compatible statement. It should neither be too generic, nor too specific. Too much is possible when it is too generic. When it is too specific you may discover that too little is possible. Several statements need to be tried out to find out which level of specificity is right within your domain and selected future. Another important aspect of the statement is to what extend is it realistic. The set statement should be achievable with certain resources. Lastly, and maybe the most important aspect of a good statement is that it is in line with the mission of the client you are working for. That is why this is a good moment to involve the client in this step in the process. In this thesis' case, PwC was involved by providing feedback and suggestions in various meetings to align the statement.

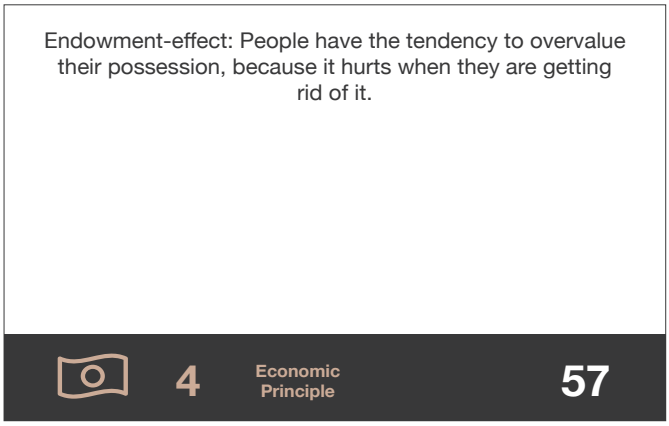


Figure 47 An example from a context factor. An index number on the bottom right and novelty score (0 – 10) on the bottom left were added besides the textual description of the actual factor. The novelty score helped me to keep track of the balance between unoriginal an original context factors. This is important to make sure you have enough original input while still dealing with future certainties.

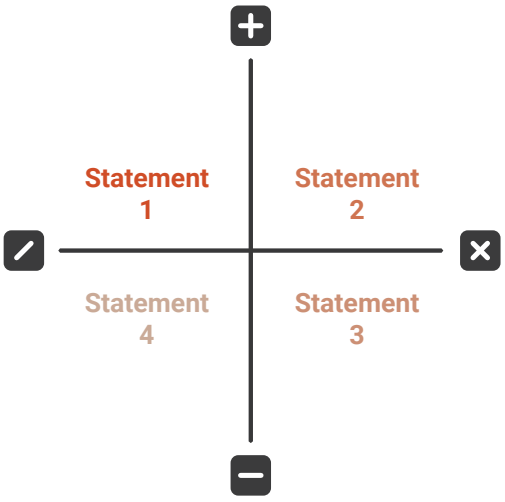


Figure 48 This is the most common way of creating a coherent structure of the earlier identified clusters. Clusters that oppose each other are placed on the axis of this reference frame. Afterwards, statement definitions can be created with combining two sets of clusters. This was of clustering did not work for this project since the complexity of this project was being oversimplified by using this method resulting in losing contextual richness from the context factors.

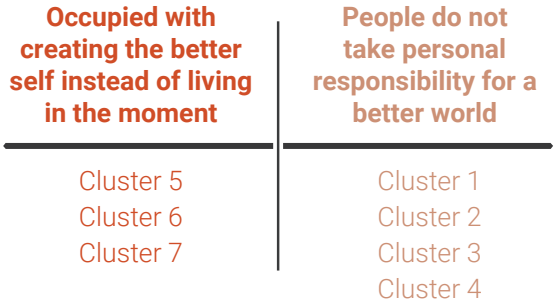


Figure 49 The two conflicting determinants of the future society conflicting on one axis. The other clusters below each determinant are different definitions of the above mentioned determinant. - is egocentric and + is allocentric

E Determining socio-economic value of an area

The analysis of location the place and the sphere of influence of a socio-economic center is a difficult process in which there is not a good or bad. It all depends on the purpose and required level of detail for which the analysis is needed. I consulted a Master student Human and Economic Geography, specialized in Business location from Utrecht University to help determining my approach to reach my goal.

The Master student suggested to look at the famous work of Walter Christaller, Jane Jacobs and Richard Florida. Their work may differ in focus, in essence they all combine urban planning, sociology and economics to get a better understanding of society and how to improve it. This combination is also often called Location theory. It tries to answers questions about what (socio)economic activities are located where and why.

The book The Death and Life of Great American Cities written by Jane Jacobs remains one of the most influential books in the history city planning it primary focus on American cities. These cities differ a lot from European cities because they are heavily focused on car usage (Chan, 2016). Also, in her book she coins the famous terms “Eyes on the street” which focus on urban safety and “social capital” the effective functioning of social groups through shared identity (Alexiou, 2006). These are interesting subjects but not from great importance for this master thesis.

The work of Richard Florida is about considers the creative class as the key driving force for economic development of post-industrial cities in the United States. This theory does not help to reach my goal as well, as it is again focused on the United States and it is too much economic focused. I found the sociological aspect lacking in this theory. Moreover, there are a couple of studies arguing that socio-economic inequalities may worsen if applying this theory on European cities (Vanolo, 2008) (Bayliss, 2007).

In the end central place theory, of Walter Christaller, was most inline what I want to achieve with my concept. His work was focused on European socio-economic behavior and how it leads to the spatial distribution of human settlements.

Central place theory

The central place theory looks at the ability of a geographical place to provide a certain function or service to neighboring areas in a region. Doing this on large scale will create a hierarchy of places on a socio-economic scale. (Braan, 2016)

History

Walter Christaller, developed the theory already in 1933 as part of his PhD thesis. However, he used is theory mostly during his time when he was part of SS-Planungsamt Reichskommissariat für die Festigung deutschen Volkstums in Germany during world war 2. This caused that the theory was mostly rejected by the world. Only in the 1950’s central place theory became more famous around the world. This even led to Walter Christaller winning various scientific prizes and receiving an honorary doctorate. (Atzema, 2012) (Schellens, 2016) The theory was also famous in the Netherlands. For decades it implicitly and explicitly served as the fundament for planning, managing and enlarging Dutch retail trade areas. (Post, 2004).

Working principle

Walter Christaller states in his theory that every service has a threshold. Threshold is the minimum required market (population or income) to successfully sell a product or provide a service. This threshold differs per service, good or experience and greatly affect the distance people are willing to travel for it. He calls this maximum travel distance ranges. If people are not within range of a certain service cost or inconvenience will outweigh the need for the good. Additionally, if the provided goods and services are from a higher order (more durable, valuable and variable), people are willing to travel further to acquire them. To give an example, high order service could be an academic hospital. A low order service could be a hairdresser. By analyzing on large scale where goods and services are provided and from what order, a map can be created that shows which areas have a “central care function” and which areas need to be cared for. Areas that provide care (often cities) are centrally located (primary area). Smaller villages are surrounding these “caring” centers (secondary or tertiary areas).

Theory limitations

There are however limitations to what extend I can use this theory to determine socio-economic centers, or in this project, mobility epicenters. Firstly, Walter Christaller makes a lot of assumptions that drastically impact the relevancy of the theory in practice. The following assumptions are done (Braan, 2016):

All areas…

- are unbounded (all flat), homogeneous, limitless surface, uniform in all directions.
- are evenly distributed population
- are equidistant and exist in a triangular lattice pattern
- have evenly distributed resources
- experience distance decay mechanisms
- have perfect competition and all sellers are economic people maximizing their profits
- have consumers that are of the same income level and same shopping behaviour
- have consumers that have similar purchasing power and demand for goods and services.
- have consumers visit the nearest central places provide the function which they demand. They minimize the distance to be travelled
- do not have a provider of goods or services which able to earn excess profit (each supplier

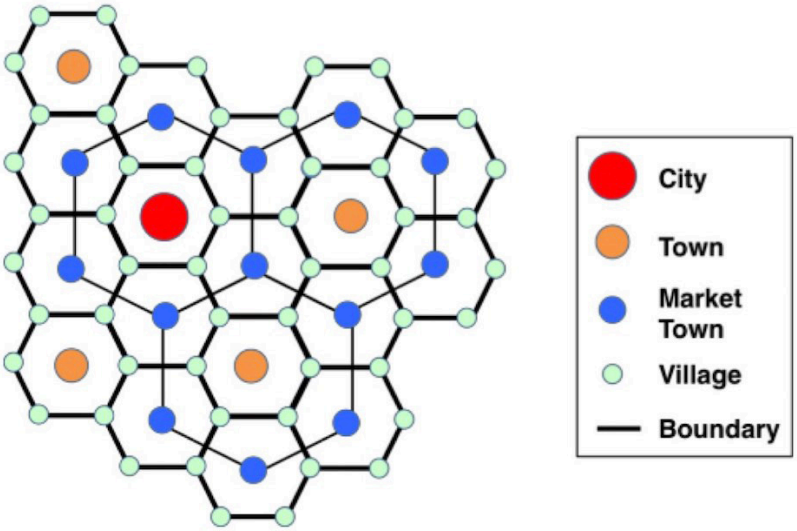


Figure 51 Netherlands according to the central place theory (Bolt, 1995)

Figure 50 Netherlands according to the central place theory (Bolt, 1995)

has a monopoly over a service area)
- have consumers that are homo economics (A fully informed and rational behaving agent in a system) (Atzema, 2012)

These are assumptions that may be done in theory but are questionable in practice. They simplify reality too an extent to which most likely too far from reality.

Secondly, central point theory does not take agglomeration into account. In the 80's urban areas were developed at the edges of big cities that could absorb the increasing number of people who were living in the city. This caused that space between the primary, secondary and tertiary centers was filled resulting in urban areas with little or no space to expand. This phenomenon is only becoming a more pressing problems since people are migrating to cities more than ever. (Glaeser, 2011) These massive metropolitan areas have a range that is extending further than the Dutch borders meaning that these areas compete on a national level with each other. It is clear if the theory still upholds on this scale.

Thirdly, the theory did not foresee the development in the domain of mobility and the development of the internet. Compared to the 1930's people are way more mobile back then. This enables them to travel much further or acquire goods or services without ever leaving the house. This has a lot if impact on the determining the value of a service.

Lastly, as mentioned earlier in this thesis, the societal and economic outlook changed from the provisioning of goods to provisioning of services. To be more specific, people do want certain services and goods not solely from a functional point of view. More often they look for a certain experience when acquiring these things. (Braan, 2016) For experience people are more willing to travel further than normal. This also affects the usability of the theory.

Alterations of central point theory

Despite all limitations, central point theory is still an interesting theory to use to determine socio-economic centers with. Some alterations were made to the theory that should improve usability and applicability of the fundaments of this theory on current and future Netherlands.

Dynamic weight of goods and services
I propose that goods and services have dynamic variables describing the durability, value and variability. Since the socio-economic outlook changed from functional to service focused (this includes experience as well), durability, value, variability may changes depending on different circumstances. To give an example, the socio-economic value of a beach increases when weather is nice. The other way, a beach has lees socio-economic value when weather is bad. The dynamic weight that is linked to the goods and service should be based on, time of day, weekday, season, weather and reoccurrence.

Group mobility epicenters that compete on the same level
Agglomeration is a phenomenon which central point theory did not take into account. In my mobility system I group mobility epicenter's, hereby creating mobility flocks, not solely on sphere of influence but also on competing power. I choose to group differently to make sure that one mobility flocks, the Randstad, is not becoming too big covering all of the Netherlands. It is then not possible to distinguish different mobility epicenters from each other, making it impossible to changes road pricing according to the origin and destination of one's journey. Grouping on competing power means in practice that you also look at the sphere of influence of the mobility flock as whole. For example, nowadays if you open a new shopping center in Rotterdam it competes besides other shopping centers in Rotterdam also with shopping centers in Amsterdam and The Hague. It does not compete that much with a shopping center in Breda. These kinds of competitions will be taken together and will form one mobility flock if the competition is somewhat of the same order.

Social media activity to location and the order of experiences
Lastly, to make sure that the central point theory is able to handle the more dynamic nature of people and their focus, social media activity will be measured. By measuring and analyzing social media activity an better overview can be created of where the unique experiences are and how much influence it has on the socio-economic centers. This focus on experience where people are more willing to travel further for was lacking in the original theory which focused more on functionality. In addition to know where unique experiences are, also insights can be gained on where the average physical or virtual attention of people lies. This is vitally important to create a connection between physical and virtual mobility which allows the two to interact with each other.

F List of services

Statistics Netherlands have come up with a list of services. This list is visible on the right hand side.

Voorziening	kilometers
Huisartsenpraktijk	0,9
Huisartsenpost	6,2
Apotheek	1,2
Ziekenhuis (incl. buitenpolikliniek)	4,7
Ziekenhuis (excl. buitenpolikliniek)	6,5
Grote supermarkt	0,9
Overige dagelijkse levensmiddelen	0,8
Warenhuis	2,6
Cafés en dergelijke	1,1
Cafetaria's en dergelijke	0,8
Restaurants	0,8
Hotels en dergelijke	2,4
Kinderdagverblijf	0,9
Buitenschoolse opvang	0,8
Basisonderwijs	0,7
Voortgezet onderwijs totaal	2,4
VMBO	2,6
HAVO/VWO	3,2
Afstand tot oprit hoofdverkeersweg	1,7
Treinstations	5
Belangrijk overstapstation	10,5
Bibliotheek	1,8
Zwembad	3,4
Kunstijsbaan	18,2
Museum	3,4
Podiumkunsten	5,1
Poppodium	11,6
Bioscoop	6,7
Sauna	8
Zonnebank	4,6
Attractie	6,9
Brandweerkazerne	2

Figure 52 A full list of the kind of services present in the Netherlands (Olden, Steiner, & Bingen, 2017)

G Concept validation materials

The following 15 pages are materials that have been used during the conducted interviews

Future of Mobility - Concept 4 assessment form

	Benodigdheden	Aanwezig
1	Pen	
2	Schrift	
3	Vision Statement A4	
4	Analogy + product qualities A4	
5	Concept A4	
6	Lijst met services A4	
7	Mobility virtualisation A4	
8	Flock App	
9	Design roadmap A3	
10	Foto	
11	Opname	

1. Naam van geïnterviewde
2. Functie
3. Achtergrond
4. Introductie van afstudeerproject
5. Doel van het interview

"De viability, feasibility en desirability van mijn concept toetsen aan uw kennis in semigestructureerd interview."

6. Achtergrond informatie over ViP
7. Explain vision statement **3**

In a world where... Socio-economic inequality, due to new (global) external factors, disables people to take personal responsibly to effectively use their mobility to grow their prosperity or that off others.

PwC wants... People to responsibly use their short-term mobility to create a better self for themselves but others too. Essential is that the succes of it depends on the increase and/or improvement in short- and longterm socio-economic prospects. Moreover, these prospectives should honour the creation of a better world for flora and fauna.

By... Creating with people's mobility surplus personal interdependencies, between people's short- and long-term socio-economic prospects.

8. (Explain analogy **4**)
9. (Explain product qualities **4**)
10. Explain concept **5**

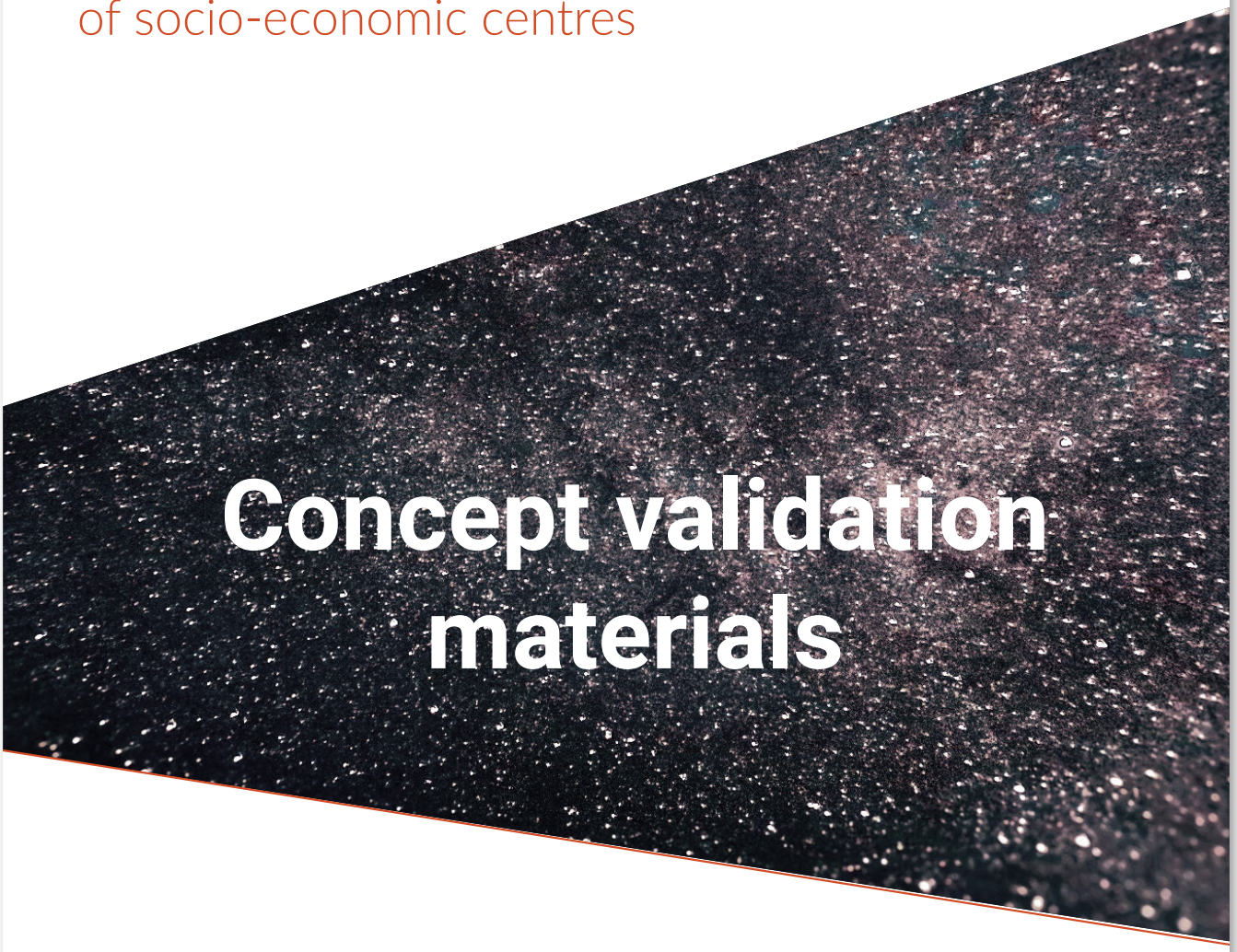
11. **Stap 2 - voor cirkels gekozen ipv 6 hoeken**
12. Scenario's

Amsterdam Oldebroek	Vakantie	Goedkoop (Laag->hoog < hoog->laag)
Oldebroek Leiden	Ziekenhuisbezoek	Duurder
Utrecht Enschede	Festival	Mobility virtualisation
Klunder Etten-leur	Boodschappen	Nagenoeg gelijk (zelfde regio (laag) zelfde ME)

11 Questions
Wat zal de invloed zijn van ME's en MF's op de samenleving?
Hoe kan je tot een goede socio-economische waarde bepaling komen van een gebied?
Wat is uw mening over rekening rijden?
Zou deze vorm van rekening rijden toekomst bestendig zijn?
Zal uw mening veranderen als deze manier van rekening rijden de standaard wordt?
Wat zal de invloed zijn van dit systeem op de samenleving?
Hoe kan het systeem van waarde zijn voor de mensen
Wat zou uw voornaamste reden zijn om mee te wilt doen aan de virtualisatie?
Wat is uw eerste reactie van de interface?
Voor welke organisatie is het meest logisch om betrokken te zijn bij dit concept
Welke stappen zou u nemen de komende 5, 5-10, 10-15 jaar om dit te verwezenlijken?

Future of Mobility

Sustainable equity through equalisation and mobilisation of socio-economic centres



Concept validation materials

1 Vision statement

In a world where...

Socio-economic inequality, due to new (global) external factors, disables people to take personal responsibly to effectively use their mobility to grow their prosperity or that off others.

PwC wants...

People to responsibly use their short-term mobility to create a better self. Essential is that the succes of it depends on the increase and/or improvement in short- and longterm socio-economic prospects for themselves and others too. Moreover, these prospectives should honour the creation of a better world for flora and fauna.

By...

Creating with people's mobility surplus personal interdependencies, between people's short- and long-term socio-economic prospects.

2 Interaction analogy

Flocking

Drafting is an aerodynamic technique where two or more objects are closely aligned at high speed to experience overall drag reduction, and so, energy consumption will be reduced for all. There are various forms of drafting. Best known example is the V Formation birds fly in. Flocks of birds fly in a V formation to reduce overall drag up to 71% (Lissaman & Shollenberger, 1970).

Product qualities

- Caring

The stronger users should display kindness and concern for others.

- Structured

The product should function according to defined plan.

- Belonging

All users should have the desire to be part of a group. This is achieved through activities that build or strenghten friendships, support intimate contact with people who we care about, or increase our sense of community.

- Unity

All users should feel the desire to maintain an overall sense of coherence with product. It is achieved through activities that provide us with a sense of connectedness, harmony, or oneness with people, nature, or a greater power.

- Prudence

All users should have the ability to choose their own actions and words with caution, showing self-control over impulses for these long-term goals. They do not take undue risks or do things that they may regret later; they make decisions with careful consideration of the consequences for themselves and others.

- Equity

The product should treat each user equally. Equity is achieved through product features that enable users to promote justice, fairness and the unbiased treatment of all people.

- Necessity

All users should experience the existence of the product as a fact of being required.

4 Concept

A nation-wide de-centralized mobility network in which it is cheaper to travel to and around weak socio-economic places.

Approach

Step 1 Determine Mobility epicenter location

Analyze daily movement of people on municipality level by looking at their starting point and destination of their travels. Minimum amount of movements that are required to count is 1000.

Step 2 Determine sphere of influence

Sphere of influence is determined by looking at the maximum range of people traveling from one place to another in one day and the total amount of people on place (inclusive residents).

Step 3 Determine value of available services

The value of a service depends on it's uniqueness in it's sphere of influence, mobility flock, time of day, weekday, season, weather, re-occurrence and social media activity.

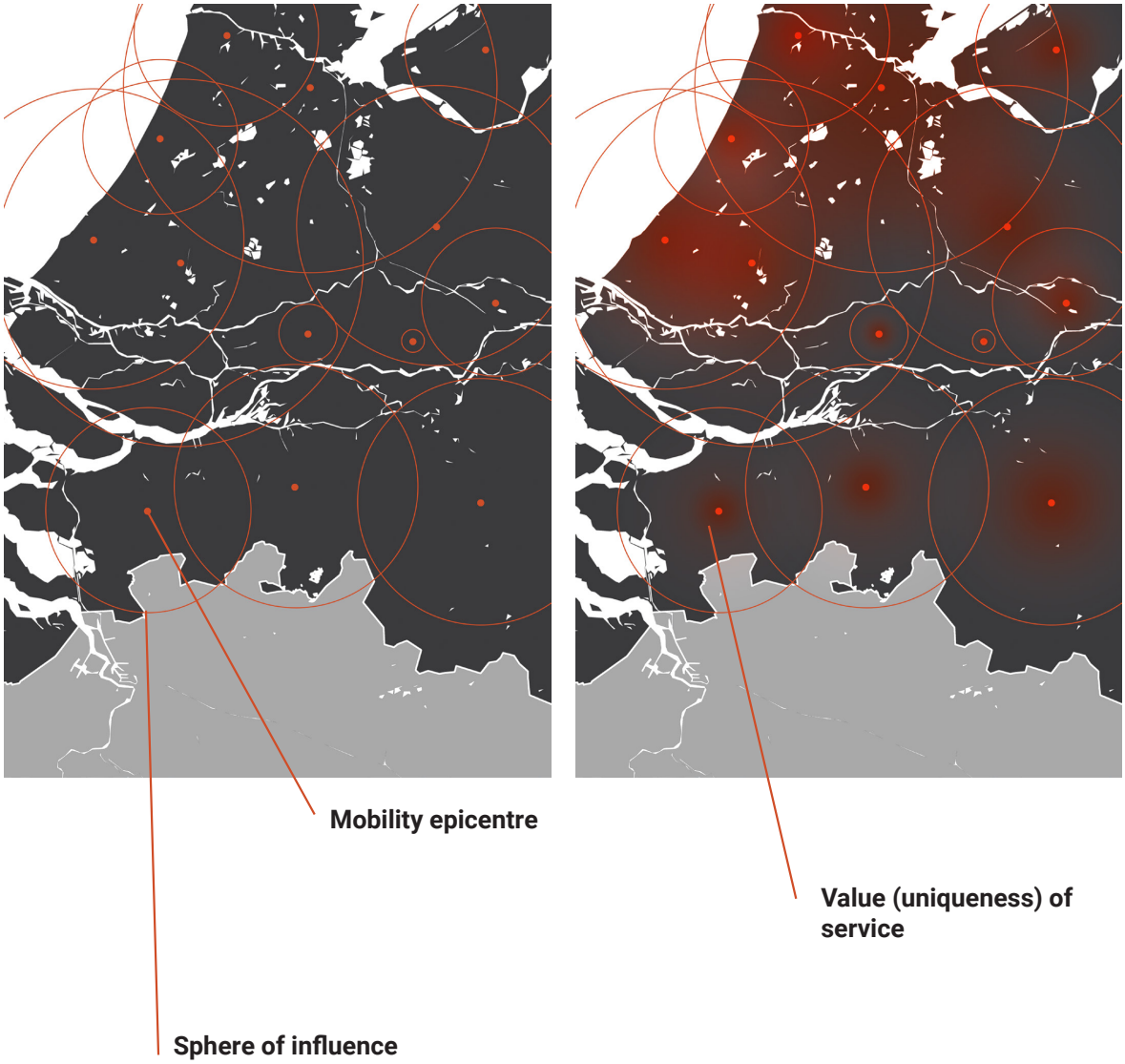
Step 4 Determine Mobility flocks

Mobility flocks are groups of Mobility epicentres and their sphere of influence that compete with each other for the attention of people. The Mobility epicentres are roughly of the same size and value.

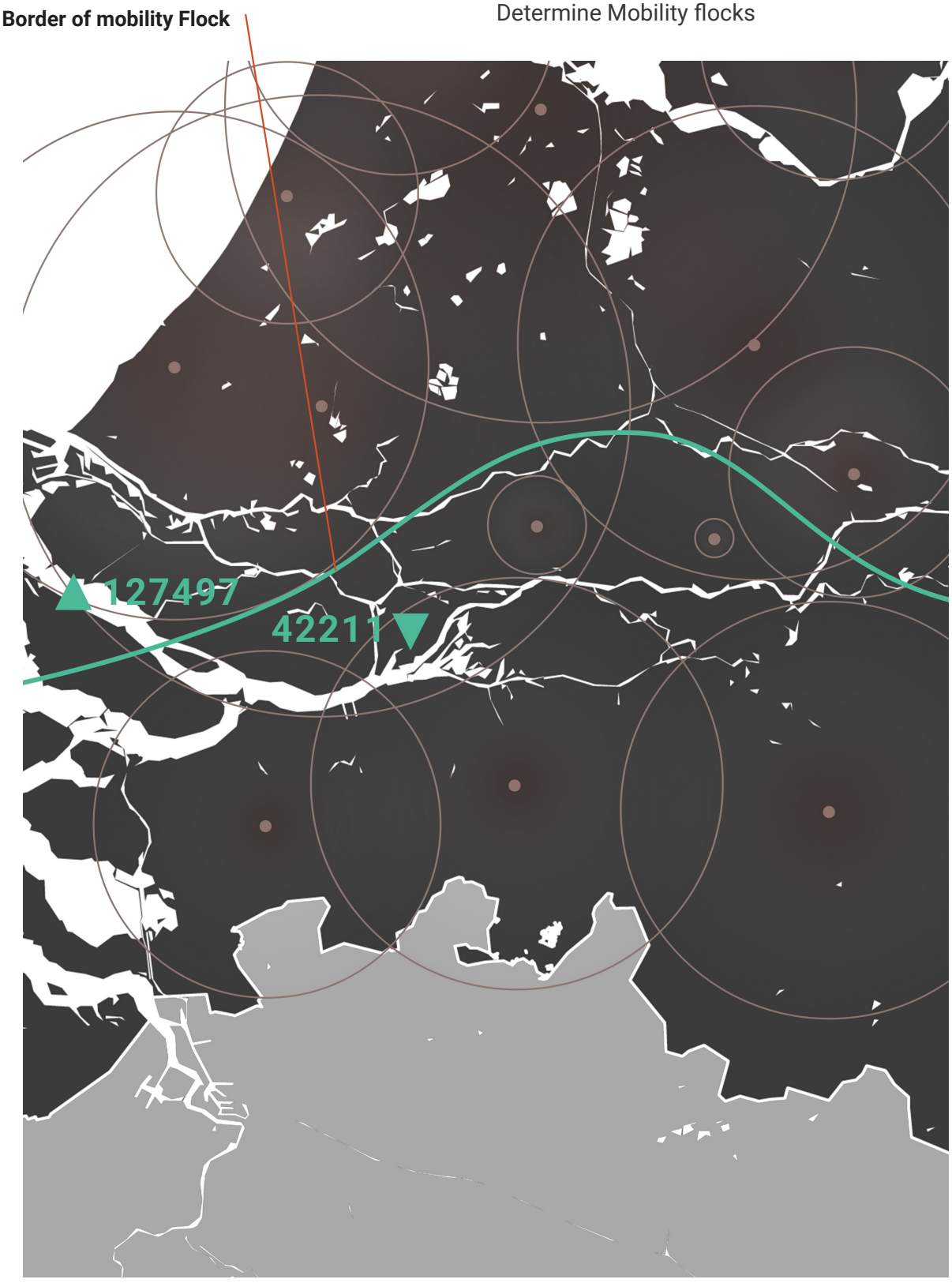
Step 1
Determine Mobility epicenter location

Step 2
Determine sphere of influence

Step 3
Determine value of available services



Step 4
Determine Mobility flocks



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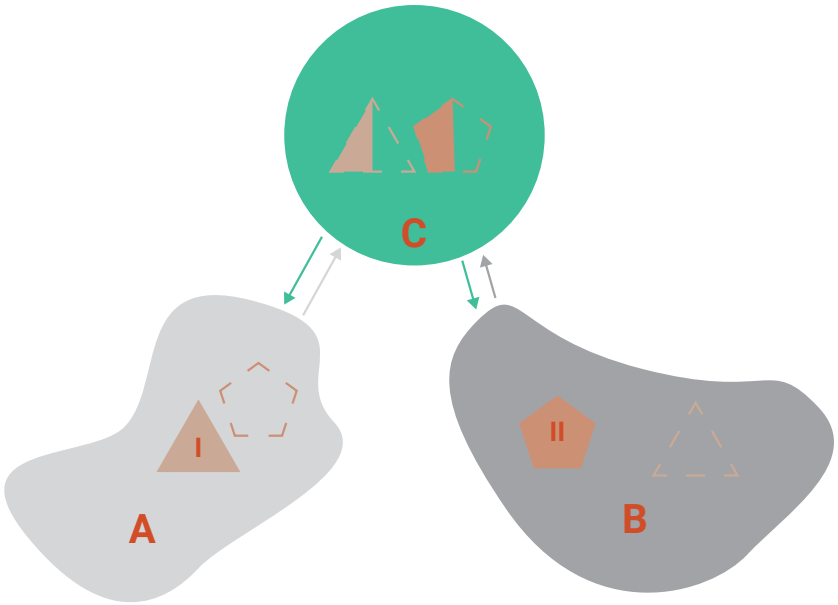
Future of Mobility: Concept assessment 7

Mobility virtualization

A mobility service in which participants are able to virtualise their mobility assets by adding them to the network. These assets become again available in a form which provides an equal amount of mobility at a different time and location. Different locations are geographically defined, defined by certain communities or organisations.



Legend

A	Zone/Community	C	Virtual mobility network
B	Zone/Community	I II	Mobility asset

Bijlage 1 Gemiddelde afstand tot de dichtstbijzijnde voorziening

Voorziening	kilometers
Huisartsenpraktijk	0,9
Huisartsenpost	6,2
Apotheek	1,2
Ziekenhuis (incl. buitenpolikliniek)	4,7
Ziekenhuis (excl. buitenpolikliniek)	6,5
Grote supermarkt	0,9
Overige dagelijkse levensmiddelen	0,8
Warenhuis	2,6
Cafés en dergelijke	1,1
Cafetaria's en dergelijke	0,8
Restaurants	0,8
Hotels en dergelijke	2,4
Kinderdagverblijf	0,9
Buitenschoolse opvang	0,8
Basisonderwijs	0,7
Voortgezet onderwijs totaal	2,4
VMBO	2,6
HAVO/VWO	3,2
Afstand tot oprit hoofdverkeersweg	1,7
Treinstations	5
Belangrijk overstapstation	10,5
Bibliotheek	1,8
Zwembad	3,4
Kunstijsbaan	18,2
Museum	3,4
Podiumkunsten	5,1
Poppodium	11,6
Bioscoop	6,7
Sauna	8
Zonnebank	4,6
Attractie	6,9
Brandweerkazerne	2

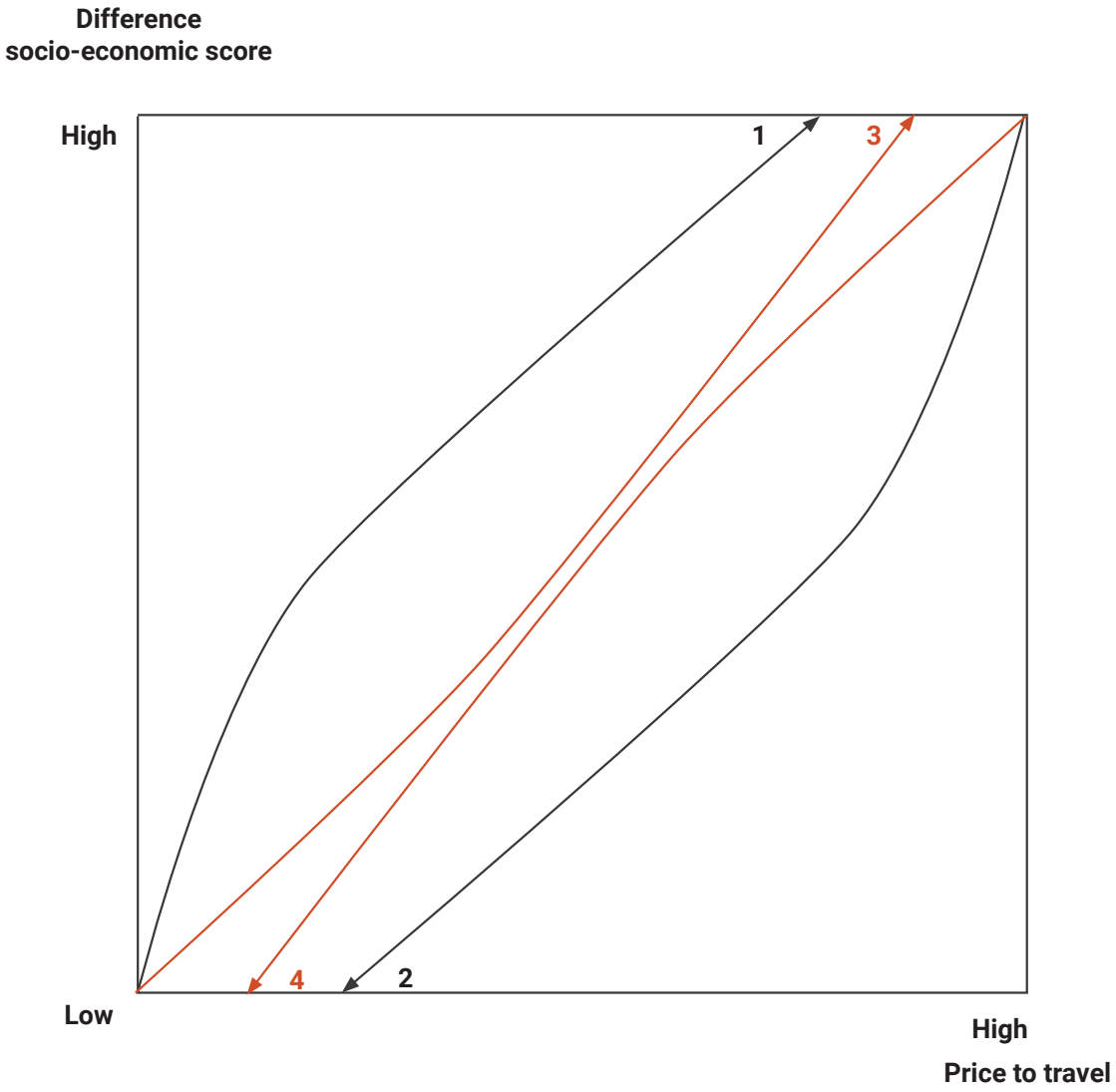
Bron: CBS

3.2 Reguliere reizigerskilometers per jaar

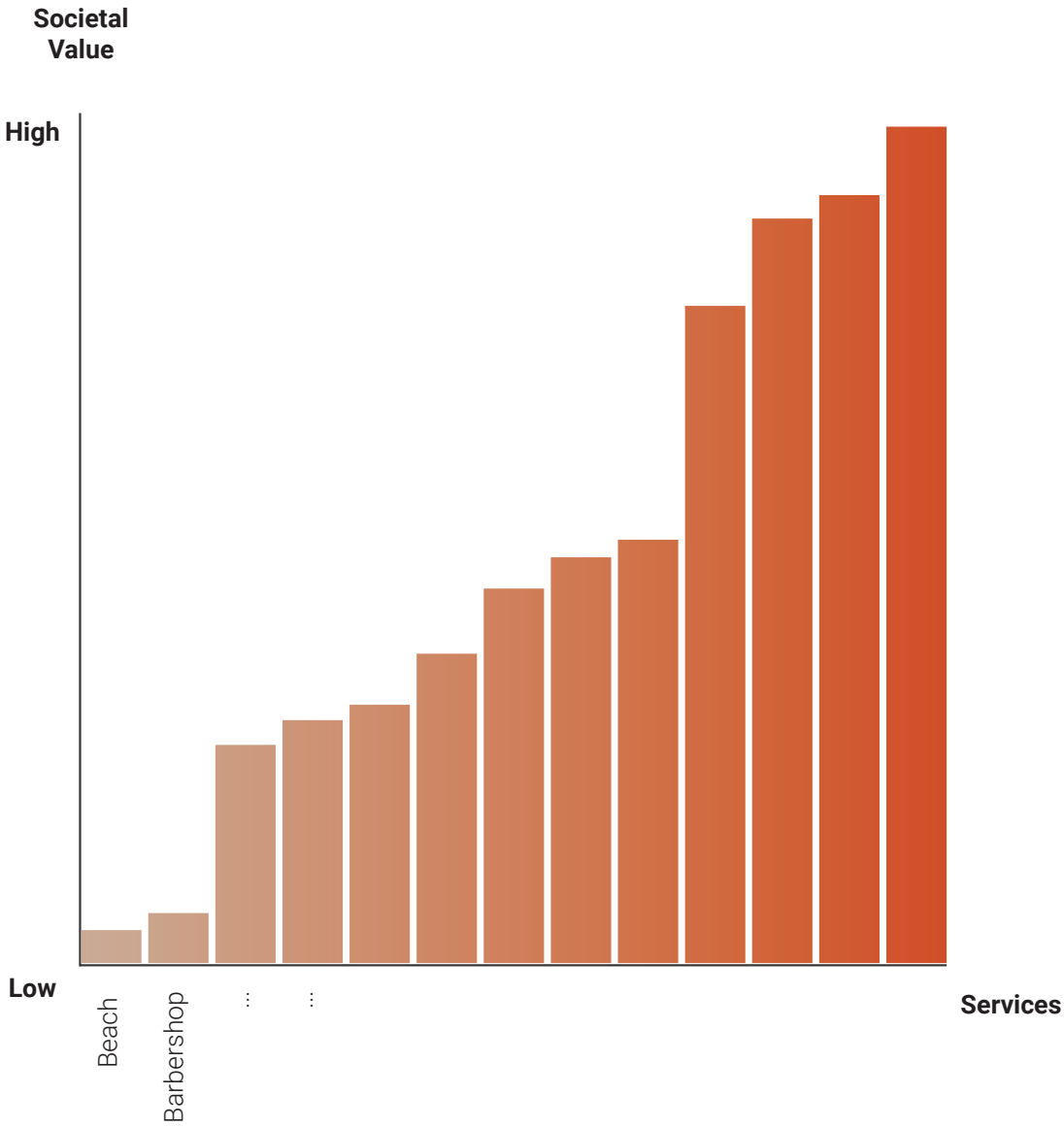
Reguliere reizigerskilometers per jaar[1)2)]

	OViN 2010	OViN 2011	OViN 2012	OViN 2013	OViN 2014	OViN 2015	OViN 2016	OViN 2017	verschil 2017–2016
	mld km								**%**
Totaal	172,4	175,3	**169,2**	**175,7**	177,3	171,0	171,7	169,9	–1,0
Reismotief									
Van en naar het werk	49,3	50,0	48,4	49,5	50,2	50,1	51,2	50,8	–0,7
Zakelijk bezoek	9,3	9,7	8,4	7,7	7,8	7,6	6,9	7,3	6,1
Diensten en verzorging	5,4	5,1	4,5	**5,2**	4,9	5,2	**4,4**	4,3	–1,0
Winkelen en boodschappen doen	16,2	16,5	**15,3**	15,4	15,7	15,2	14,8	15,6	5,5
Onderwijs of cursus volgen	11,1	11,9	11,6	11,6	12,0	12,5	12,4	11,7	–5,8
Visite en logeren	31,0	31,1	31,9	34,0	35,2	**32,8**	32,2	31,6	–1,6
Sport, hobby, horecabezoek	30,2	29,6	29,5	**31,8**	33,4	31,7	33,0	32,5	–1,4
Toeren en wandelen	5,8	**6,5**	5,9	6,5	**7,4**	6,0	6,0	5,7	–4,4
Ander motief	14,1	15,0	13,7	14,1	**10,6**	9,8	10,8	10,2	–6,1

[1)] Reizigerskilometers van alle inwoners in particuliere huishoudens van Nederland binnen Nederland.
[2)] Vetgedrukte cijfers geven een significant verschil met het jaar ervoor aan.

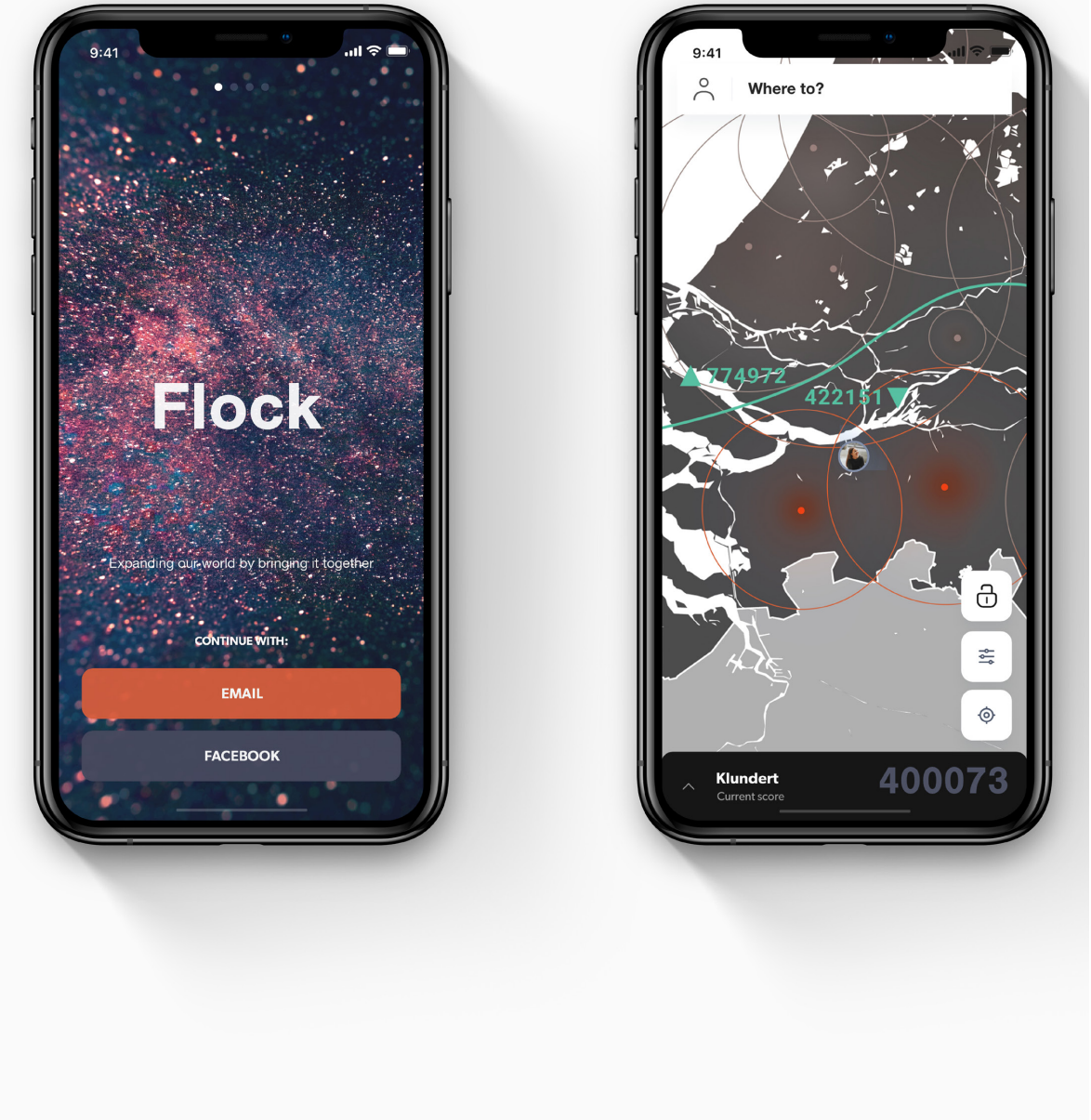

Difference
socio-economic score
High
Low
1
2
3
4
High
Price to travel

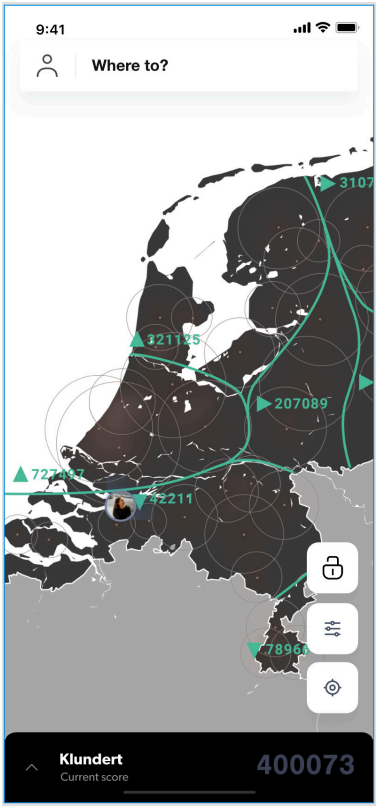
5 Societal value

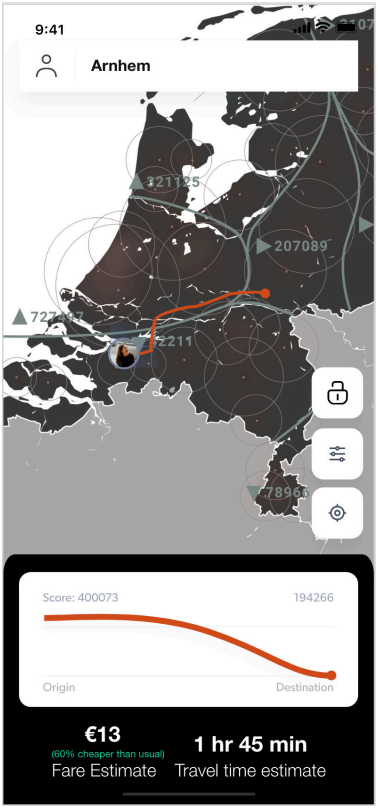


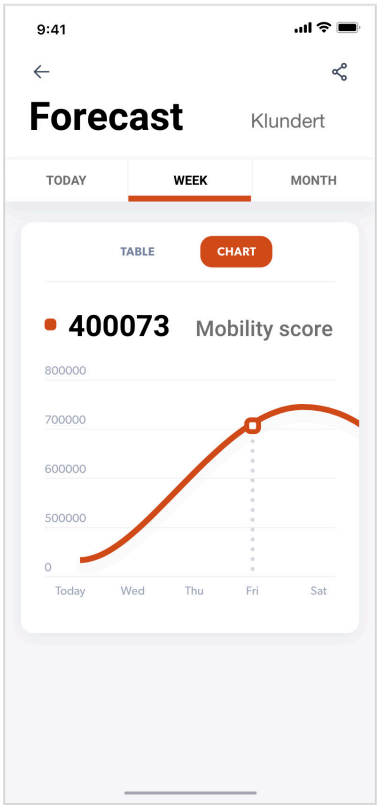
Societal Value = Created jobs x people x C02 emissions x ....

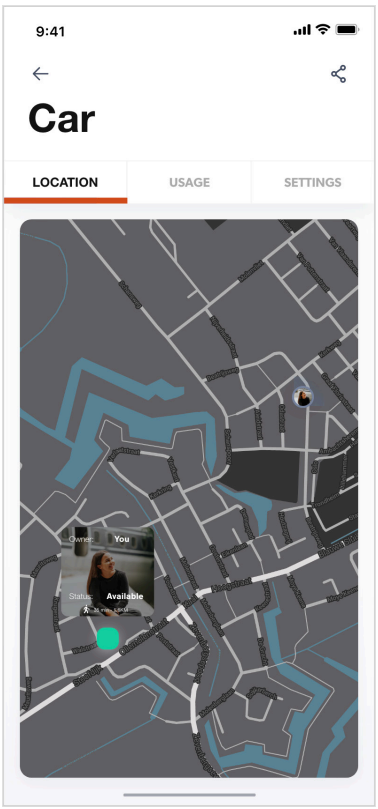
5 Embodiment of the interface

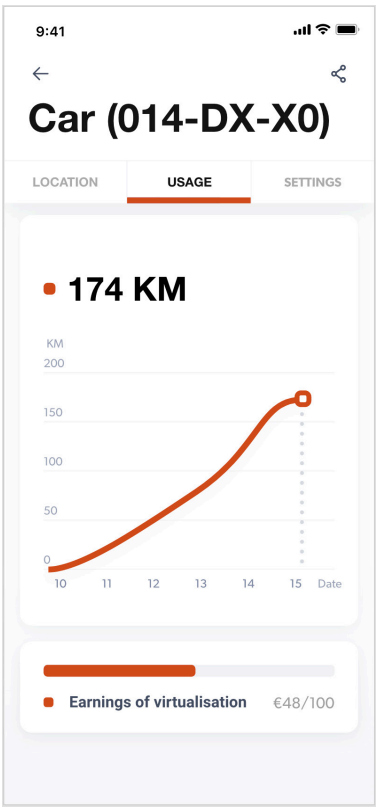



9:41
Where to?
Klundert
Current score
400073


9:41
Arnhem
Score: 400073
194266
Origin
Destination
€13
(60% cheaper than usual)
Fare Estimate
1 hr 45 min
Travel time estimate


9:41
Forecast
Klundert
TODAY
WEEK
MONTH
TABLE
CHART
400073
Mobility score
800000
700000
600000
500000
0
Today
Wed
Thu
Fri
Sat


9:41
Car
LOCATION
USAGE
SETTINGS

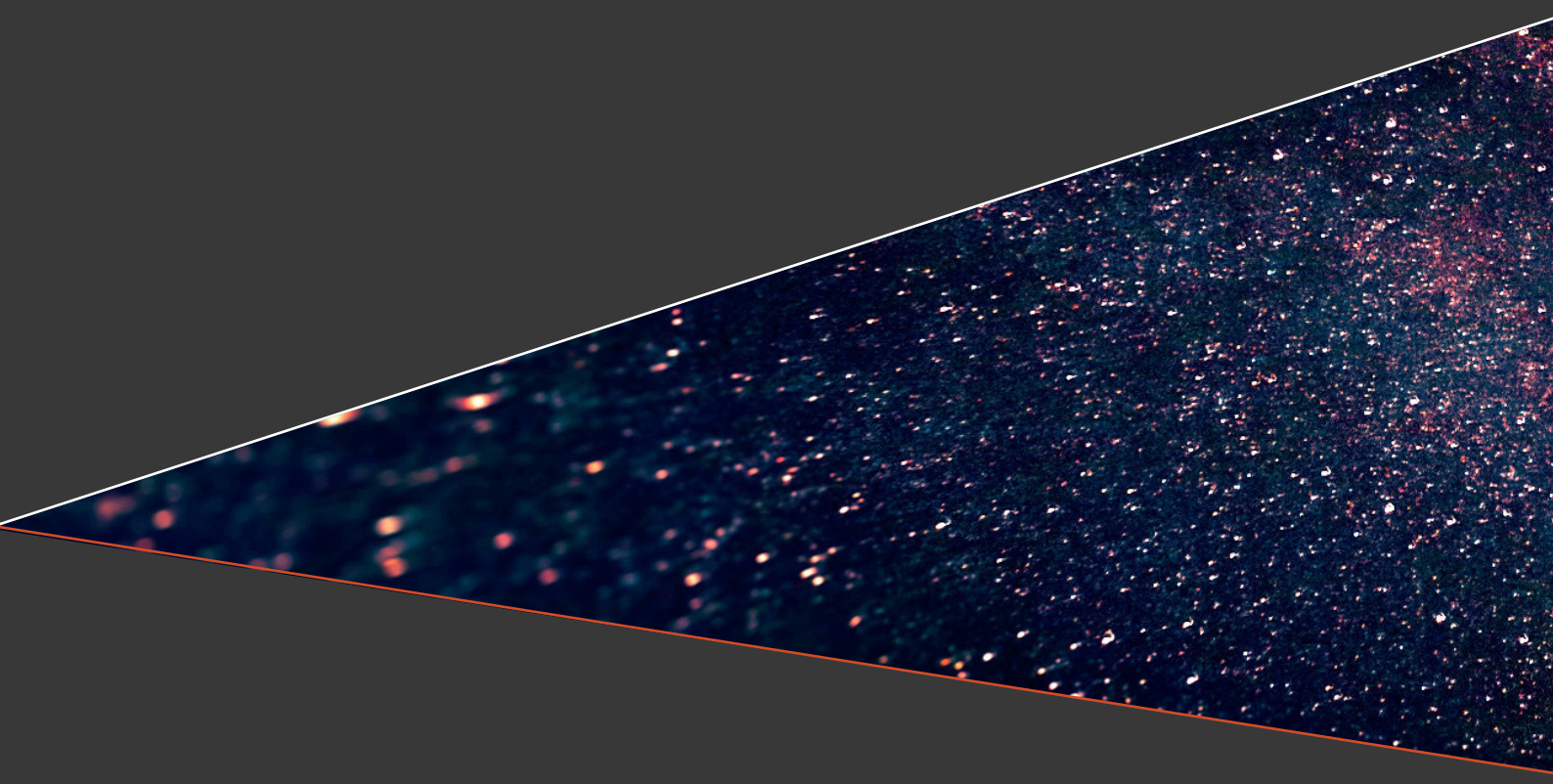

9:41
Car (014-DX-X0)
LOCATION
USAGE
SETTINGS
174 KM
KM
200
150
100
50
0
10
11
12
13
14
15
Date
Earnings of virtualisation
€48/100

H Concession area's

Figure 53 The Netherlands divided in 14 concessions areas (Roelof88 & Regenmaker, 2015).

About this thesis

The document you are about to read is a master thesis which is part of the graduation project of the Faculty of Industrial Design Engineering (IDE) of Delft University of Technology. Graduating at the IDE faculty means demonstrating your capabilities as Industrial Design Engineer to the University, society and myself. Besides demonstrating my capabilities, graduation for me also meant challenging myself to develop myself further as an industrial designer. I did this by challenging myself to become more acquainted with the Vision in Product Design method by designing a product–service system within the corporate context of PricewaterhouseCoopers Netherlands. I was part of the Experience Center during my graduation project. This thesis gives and in-depth view of the seven months long design process and the achieved result, a future mobility product–service system that aims at reducing future socio-economic inequality in the Netherlands by 2035.



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