# Design of a reservation system for electric car sharing

Bachelor thesis | Niek Binnenmars
In coöperation with Lochem Energie

LOCHEMENERGIE
Je eigen energie

UNIVERSITEIT TWENTE.

# Information

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# Preface

Three months ago, the project of designing and creating a new reservation system for LochemEnergie started. The old system was not user friendly and it took a lot of labor to keep this system up. It was time to improve this service and design a more friendly-to-use system.

This project is an assignment for LochemEnergie and a Bachelor Thesis for the University of Twente and the program industrial design. In this report a start has been made in developing a new and improved reservation system as it will be developed in the upcoming years. The assignment has been made in cooperation with LochemEnergie, several customers of LochemEnergie and Casemaster solutions, an IT-company.

First, I would like to thank Mr. Bertus Dispa, from Casemaster Solutions. Multiple brainstorm sessions on how to implement the desires functionality in the software were being held and these were very useful with the development of the first prototype of the system. Secondly I would like to thank Dr. Ir. Tonnie Tekelenburg, as supervisor of this assignment from LochemEnergie. He helped me to get in contact with the right people, introduced me in the world of LochemEnergie and provided useful information and feedback that was needed for this assignment. Also I want to thank Juha and Kai Wegerif. They are the two brothers that manage the whole car reservation process at the moment. There were a few conversations where they gave feedback and a lot of useful information.

Niek Binnenmars

# Summary

LochemEnergie has the goal to provide the City, and possibly the whole municipality of Lochem, with facilities that provide sustainable energy. This is meant to be achieved in 2030. There can be thought of projects that provide, solar, wind or water energy, as well as helping the citizens with minimizing the waste of energy. For a year, Lochem Energy has provided a service with which the people of Lochem can rent a vehicle for a short period of time. This project was so successful, that the board of LochemEnergie has decided that this project should be extended and made free some money to improve this service.

At the moment the procedure of renting vehicles is being managed by a lot of volunteers. The procedure is not efficient at all. Every reservation is processed manually and the confirmation mail, maintenance, billing, etc. is done by the two brothers. This costs a lot of time. If LochemEnergie has the desire to expend, which it does, this process should be automated. Therefore, several parties are busy with the development. This project is also a part of the development.

At first, information is gathered to identify the need of the users for this app and the functions it should provide. All the desired functions of the app are looked into, as well as the realization of these functionalities. Some functions would be really great for this app, but it cannot be realized, due to technical difficulties or not being able to access the desired information.

After looking into all of the different functions, a first prototype is made which is mostly interactive as it looks the same as it should when the app is fully functional. This way, by testing the prototype, information could be gathered to improve the app in the future. After building the prototype, the prototype is put online and feedback is asked on this from several parties. This feedback could unfortunately not be fully processed into a next prototype.

# Samenvatting

Het doel van LochemEnergie is om er voor te zorgen dat Lochem, zowel de stad als eventueel de gemeente, te voorzien van duurzame energie. Het is de bedoeling dat dit in 2030 is gerealiseerd. Er kan dan gedacht worden aan verschillende projecten die er voor zorgen dat er in en rond Lochem zonne- wind- en waterenergie wordt opgewekt, als ook er voor te zorgen dat de bewoners zo min mogelijk energie verspillen. Het afgelopen jaar heeft Lochem energie er voor gezorgd dat er onder andere een project liep waar elektrische auto's zijn verhuurd in de gemeente Lochem. Dit kon voor een korte tijd gebeuren, een dag of een dagdeel. Dit project is erg positief ontvangen, waardoor het bestuur van LochemEnergie er voor heeft gekozen dit project te verlengen en een bedrag vrij te maken om deze service te verbeteren.

Op het moment de procedure van huren en verhuren van elektrische deelauto's wordt gemanaged door een groot aantal vrijwilligers en het is alles behalve efficiënt. Elke reservering wordt handmatig verwerkt en ook de bevestigingsmail wordt handmatig verstuurd. Dit wordt vooral gedaan door twee broers. Dit alles kost een hoop tijd en als LochemEnergie de wens heeft in de toekomst uit te breiden, wat het heeft, zal het dit proces moeten automatiseren. Vandaar dat op dit moment meerdere partijen bezig zijn met het ontwikkelen van dit systeem. Dit project is daar een onderdeel van.

Eerst is er informatie verzameld over de eisen en wensen van de klant en over de functies dat het systeem zou moeten hebben. Vervolgens is er al deze functionaliteiten gekeken, als ook de mogelijkheid om deze te integreren in de app. Sommige functies zouden erg mooi in deze app kunnen passen, zou het niet zo zijn dat dit technisch niet mogelijk is of dat de rechten voor de benodigde informatievoorziening (nog) niet bij LochemEnergie liggen.

Na het uitzoeken van de benodigde functionaliteit, een eerste prototype is gemaakt dat grotendeels interactief is en er uitziet als de uiteindelijke app ook zou werken. Op deze manier kan dit prototype worden getest en met de informatie die hierdoor wordt vergaard, zouden verbeteringen kunnen worden toegepast. Dit is ook gedaan door het prototype op te sturen naar meerdere partijen en feedback te vragen. Dit is echter nog niet volledig kunnen worden toegepast in de volgende versie.

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# 1. Introduction

## Introduction

An energy neural Lochem, that is the goal of LochemEnergie. In 2030, Lochem should produce all of its energy in a sustainable way. Besides solar energy, and wind energy where some orientating projects are being done, one of the services of LochemEnergie lies in a new, upcoming technology that in time, will play a big part in our transportation system: Electric driving.

Since a year, LochemEnergie arranged a small amount of vehicles to start testing sharing these cars between customers. This project is growing ever since. Because it is received very positively by a lot of customers, this project is being extended for at least another year, and probably more. The way in which this is arranged is not very efficient because a lot of the management of the reservation process is being done manually. This has to change in order to grow this service to the 50+ cars that is desired.

To realize this, multiple parties are set together to work on a new reservation system that automates the management of reservations and payments. It will give a lot more functionality to make hiring an electric vehicle at LochemEnergie as user-friendly as possible. Software to process all the data is being built and an application for the users to reserve the cars, hence, this project.

This report is a description of the design process that is done in order to determine the different requirement the customers have in such a project and how these requirements are translated into the design of the application. Several theoretical frameworks that focus on user integration in the design process have been userd. The main questions that will be asked are: What are the requirements of the users in a system like this? What is the most important information for the customers? and how will the layout of the app become?

# LochemEnergie

Lochem Energie is the client of this assignment. Lochem Energie is an initiative of the citizens of Lochem. The initiators want to provide tools to make sure that in 2030 their Energy is produced in their own municipality. Both citizens and local companies work together to achieve this goal. The reasons they give for doing this are:

- They want green energy because oil and gas is running out. Coals and nuclear power plants are not attractive.
- It is financially attractive for the local citizens.
- They don't want to rely on big energy producers or instable governments.
- It is fun to produce your own energy.
- Locally produced energy is efficient, there are no losses by transport.
- It produces employment possibilities.
- Eventual profit will flow back to the citizens in the cores of Lochem, the swimming pool or the local football club.

To realize this, Lochem Energie provides a couple of services. For instance, you can rent solar panels in a solar park of Lochem Energie. They provide advice for citizens who want to invest in solar panels, isolation and LED-lights for their own use. They also realize plans with housing associations for tenants. Research to possible use of wind and water energy is done. But the service that is going to be focus on is that they are renting electrical vehicles to the citizens of Lochem. At the moment about 5 Smart electrical vehicles are in use. These cars are leased, so they are not the property of Lochem Energie. To make use of this service, you have to be a member of Lochem Energie, which costs €25,50 per year. A car can be rented for one part of the day or one whole day. One morning for example, costs €5,00 and to rent it for a day it will cost €10,00. This is inclusive power for the vehicle and insurance. These amounts will change in the future, as prices like these will not be feasible in the future.

# 1. Introduction

## Current situation

At the moment there are five cars in Lochem that can be rented, three of them stand at the Koedijk, one of them stand at the town hall, in Lochem North, and one of them at the Heuvelenweg, which is in Lochem East. These cars can be rented for several periods: People can rent the car for an entire day, this will cost them €10. Or customers can rent a car for a shorter period, as a morning, an afternoon or an evening. Multiple periods cannot be selected at the moment. So if you need to rent a car from 16:00 to 20:00 you will have to rent the car for an entire day. A customer can choose the desired location to pick up a vehicle. This is done by sending a reservation request from the site of LochemEnergie. A mail will be sent to a voluntarily family where two brothers manage the reservations. The request will be processed between 9 and 10 in the evening, where one of the two brothers will check if the car is available and send a response mail to the customer which confirms or denies the reservation. After this the customer can pick up the vehicle at the desired location. and time. At the Heuvelenweg, the customer can open a locker with a four-digit code to grab the key. The locket is on eye-height, so that it cannot be missed. At the town-hall, the key can be picked up at the desk inside the building. On the Koedijk, the customer has to go to the house of the same family as before to receive the key. On return, the key can be dropped in the mailbox so that the family will not be bothered. The users will have to plug the car out on depart and plug it back in on return. The payment will be done by direct debit. The treasurer of LochemEnergie will receive the overview of reservations per month and he then can send this, processed into a special format, to the bank. The costs made by charging during the reservation period, which can be done with a card that lays in the car, is paid by LochemEnergie itself.

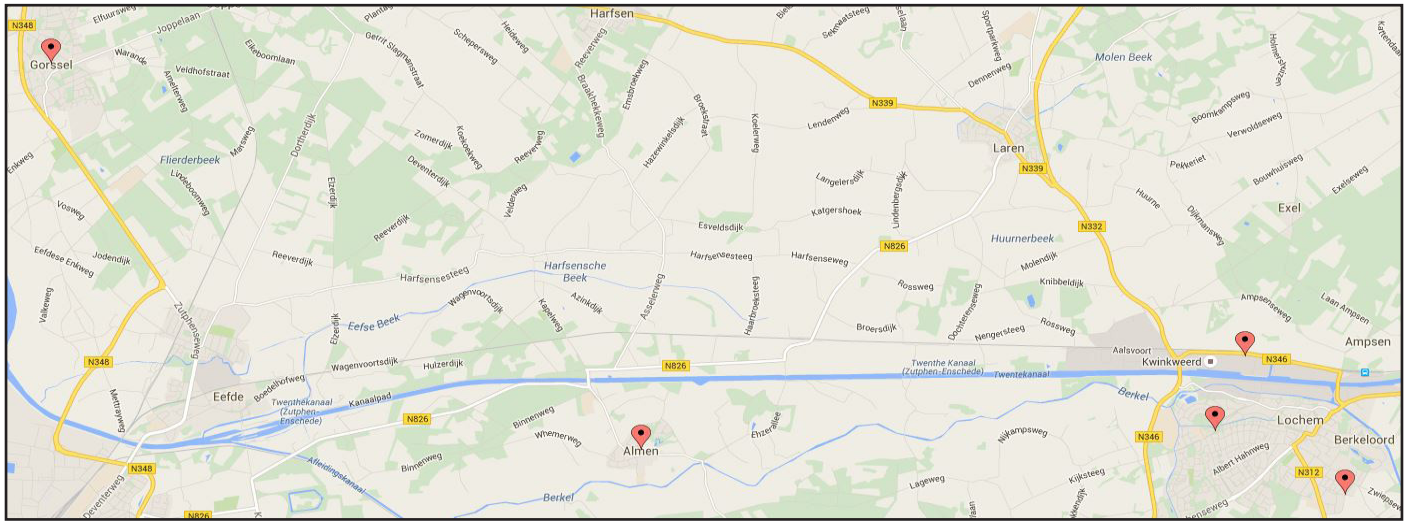


*Fig 1. Map of the car locations*

# Why the assignment?

As seen in the description of the current situation, the process of reserving a car is a lot of work. If LochemEnergie is going to expand the business of Electric Car rentals, improvements to this system have to be made. The goal of LochemEnergie is that the rental business will grow to 50+ cars, or maybe even more. LochemEnergie wants to expand to the nearby cities and villages, to ultimately become a big carsharing center in the region. With the current situation of handling reservations, this will be very difficult to realize. The most difficult part of the business is that the costs have to be as low as possible, to lower the prices of the rentals to an acceptable level. This means that a system should be developed that manages the rentals for LochemEnergie to minimize the hours people have to spend managing rentals. In the end, the volunteers of the family, especially the two brothers have to be replaced by a system. This will make the rental process a lot friendlier for LochemEnergie. This will not only be a lot easier for the employees of LochemEnergie. The customers will also benefit from this new system. The system will make renting the electrical cars more user-friendly. People can get a better overview on the trips they took and the cars they rented. Also the user will immediately be able to view if the car is available. Overall, the current system of car rentals of LochemEnergie is very insufficient and improvements have to be made to make it possible for the company to grow.

# 1. Introduction

## Assignment desription

LochemEnergie is a cooperative association of citizens in Lochem who want to contribute to make Lochem in 2030 a self-generating municipality of sustainable energy. Citizens take the initiative and work together with local companies to realize this goal. This plan is ambitious and it is going to take a while to realize this.

As part of the IPIN project: the testing ground Slim Net Lochem, where LochemEnergie cooperates with the network Administrator Alliander and the University of Twente, four electrical vehicles were made available. These cars are made available by LochemEnergie for customers to rent. This project has been running for one year now and has been received very positive. There has been observed that there is desire for a system that makes reservation and payments easier. Software for sharing petrol cars already exists, but to make this successful for electrical vehicles there are other difficulties.

The goal of this assignment is to design a system that takes all the difficulties found with renting electrical vehicles into consideration. A survey will be spread and interviews will be held with different stakeholders (People from LochemEnergie, Software developers, Customers and other involved parties.) By analyzing these, a program of requirements is made. The Design of the app will then be made, taken into account the requirements, and a first prototype will be made in Axure.

If possible, The prototype will be tested and reviewed, whereupon a final design of the app will be made. This will all have to be in co-operation with Casemaster Solutions. Casemaster Solutions is going to develop the software for the Back- and Mid- office of the system.

# Stakeholders

**LochemEnergie**

LochemEnergie is the party that offers the service of electric car rental, and probably will be the owner of the software when it is developed. This ownership will possibly be shared with Casemaster Solutions, that will develop the backoffice software for the application. Lochem Energie will have the responsibility to implement the software in the daily routine of the company and has the job to keep it up to date. Lochem Energie is the actual client of this project, and the result of this project will be the start of their project in growing their Electrical Carsharing business.

**Casemaster Solutions**

Casemaster Solutions is the company that is going to develop the back- and mid- office software of the application. The design of the application will be adjusted to their capabilities. Casemaster will have to be able to program the app as it is designed. If this is not the case, the design will be useless. The contact with Casemaster solutions has to be good, so that the design will be adjusted accordingly.

**The Customers**

The Customers will play a big part in the design of a product or service, because they will be the user of the product. The new reservation system should reflect the requirements and wishes of the customer as that will result in more satisfied customers. Having satisfied customers will possibly have them rent more cars with LochemEnergy, so this is one of the most important stakeholders.

**Allego**

Allego is the provider of charging stations. The application could be helping the customers to find charging stations when they're on a trip with one of the cars and the battery is starting to run out. One of the projects of Allego is Motown, Motown is an open source application that gives players on the EV-market a possibility to create their own software with the basic functions of Motown. This project is not successful yet. After analysis of the software it was clear that the code was not of high quality, so it is not clear if the software is going to be reliable. In the future, a cooperation with Allego could be possible for LochemEnergie. It will help both parties to grow and learn from each other.

**Alliander**

Alliander is the net provider. Charging electrical vehicles can have great effects on the electricity grid. It can push it to the limit when charging in the peak hours (18:00 – 20:00). When this peak gets too high, the network can go down. In the future, more people will be going to use electric vehicles. When there are a lot of cars charging in one street, the change of a blackout are getting bigger. Knowing this, it could be interesting to involve Alliander in this project.

# 2. Literature Research

## Service-Dominant Logic

"Service science is an emerging discipline concerned with the evolution, interaction, and reciprocal co-creation of value among service systems." (Maglio and Spohrer 2008; Spohrer et al. 2008). Looking at value among certain systems, which can be everything around us, there are two types of ways of looking at it. The first one is goods-dominant logic and the second is service-dominant logic. G-D logic sees economic exchange in terms of the production of units of output, which acquire value during the design and manufacturing process. S-D logic is a service-centered alternative to the traditional goods-centered paradigm for understanding economic exchange and value creation that has been identified as an appropriate philosophical foundational for the development of service science. (Vargo and Archpru Akaka 2009). In simple words, G-D logic sees adding value as the exchange of goods, where S-D logic sees everything as an exchange of services, whether this is in the Business-environment, social environment or the natural environment. The earth for example exchanges a service with the trees as the tress nurture for the earth and the earth becomes fertile when the tree dies. In the early days G-D Logic was the main way of looking at adding value. This is because the foundation of G-D logic lies in the work of Smith (1776), who was later called the father of economics. His meaning with this way of thinking was to define how England could become a wealthy country. In those days, communication and travel was very inefficient, so the main way of earning lots of money was trade. Nowadays, trade is still important, but by the enormous growth of IT and ways of communication, services have become more and more important and cannot be left out of the picture. For example there is a large market in building websites, applications and web-applications, and building those is not a good, but a service. The service centered view suggests that market exchange is the process of parties using their specialized knowledge for each other's benefit – That is, for mutual service provision (Vargo and Archpru Akaka 2009). There are ten foundational premises of S-D Logic:

| FPs | Foundational premise | Comment/ explanation |
|---|---|---|
| FP1 | Service is the fundamental basis of exchange. | The application of operant resources (knowledge and skills), "service", as defined in S-D logic, is the basis for all exchange. Service is exchanged for service. |
| FP2 | Indirect exchange masks the fundamental basis of exchange. | Because service is provided through complex combinations of goods, money, and institutions, the service basis of exchange is not always apparent. |
| FP3 | Goods are distribution mechanism for service provision. | Goods (both durable and non-durable) derive their value through use – the service they provide. |
| FP4 | Operant resources are the fundamental source of competitive advantage. | The comparative ability to cause desired change drives competition. |
| FP5 | All economies are service economies. | Service (singular) is only now becoming more apparent with increased specialization and outsourcing. |
| FP6 | The customer is always a co-creator of value. | Implies value creation is interactional. |
| FP7 | The enterprise cannot deliver value, but only offer value propositions. | Enterprises can offer their applied resources for value creation and collaboratively (interactively) create value following acceptance of value propositions, but cannot create and/or deliver value independently. |
| FP8 | A service-centered view is inherently customer oriented and relational. | Because service is defined in terms of customer-determined benefit and co-created it is inherently customer oriented and relational. |
| FP9 | All social and economic actors are resource integrators. | Implies the context of value creation is networks of networks (resource integrators). |
| FP10 | Value is always uniquely and phenomenological determined by the beneficiary. | Value is idiosyncratic, experiential, contextual, and meaning laden. |

*Fig 2. The 10 Foundational Premises of S-D Logic*

# Co-creation

Service Dominant logic states that customers are  co-creators of value. This is explained in FP6 (Fig. 2 and 3). Little is known on how customers engage in the co-creation of value. Payne, Storbacka and Frow (2007) state that there are five states of co-creation of value. First, the emotional engagement of customers through advertising and promotional activities. Second, self-service, where there is a transfer of labor to the customer. Third, the supplier provides an experience and the customer is part of the context. Fourth, is when the customer self-selects, using the supplier's prescribed processes to solve a particular problem .Fifth, the supplier and customer engage in the especially important activity of co-design of products. In the first example, you can think of people that are part of a promotional stunt, in which he or she creates a connection with the product. The product influences its perception and the product will feel better for the customer to use. In the second case, there is the transfer of labor, this can be seen as a cafeteria. The user has to do labor himself, by grabbing the food himself, to make use of the service provided by the cafeteria. The third state is that the supplier provides an experience, like an amusement park. The amusement park creates an experience in which customers can entertain themselves. By having customers experience the desired service, value is created. The fourth state is by letting the customer choose how a product (partly) is build. A good example of this is the car industry, where customers get the possibility to choose the desired features they want on the car. Here the customer chooses how the product will be built in the end. The fifth stage is when the customer is being integrated in the design process. This means that before the product is being sold in the market, the customer plays a role in the design process, letting know its requirements, wishes, making sure the value of the designed service is as high as possible.

| | |
|---|---|
| **FP6** | The customer is always a co-creator of value. Implies value creation is interactional. |

*Fig 3. The 6th Foundational Premise of S-D Logic*

# 2. Literature Research

## Voice of the customer

The voice of the customer (VOC) is a term which is used in business to describe the process of capturing customer's requirements. (Steven P. Gaskin et al.) VOC will provide a detailed understanding of the customer's requirements, is a common language for the team going forward and it provides key input for the setting of appropriate design specifications for the new product or service and provides a highly useful springboard for product innovation. With the VOC, you can recognize four aspects: customer needs, a hierarchical structure, priorities and customer perceptions of performance. The distinction between customer needs and physical measurements has proven to be one of the keys of success in marketing. Customers see the world through a 'lens' as illustrated below.


*Fig 4. The Lens-structure*

Customers make their choices as a result of their perceptions of the product. This is not the same for every customer. The perceptions of the customer are based on two things. The product features influence the perception of the product for the customer, as is the advertising, packaging and so on. This perception of the product, in combination with the price will have effect of the choice that will be made by the customer.
Knowing the needs of the customer is very important for marketing as well as product development. As a development team focusses on solutions to early, creative possibilities will be missed.

# 10 Heuristics of Nielsen

There are ten heuristics that have to be taken into consideration when designing a user interface. These heuristics have been developed by Jakob Nielsen and Rolf Molich. These principles are called heuristics because it is not a particular guideline. They are more used as rules of thumb, to create an interface as efficient and user-friendly as possible.

**Visibility of system Status**
The user should always be informed about what the system is doing. This is done by giving appropriate feedback within reasonable time. Examples of this are a loading bar which shows how far the process is and illustrates how long it still has to go. Also, informative messages can be used to let someone know what is going on, for example when entering a wrong password, the app should explain why someone cannot log in.

**Match Between system and the world**
Information, icons, words etc. should be familiar for the user. Real-world conventions should be used, making the information appear more natural. Using metaphors is a strong way of doing this. For example iTunes uses the term 'library' to make clear that this is the collection of your media.

**User Control and freedom**
Mistakes are made very easily, also in the use of an interface. A quick escape of this mistake is therefore necessary, without going through an extended dialogue. Making use of an 'undo' button makes navigating through an interface much easier. For example, in every web browser, there is an 'undo' and 'redo' button.

**Consistency and standards**
Terms that are used in similar platforms should be used, to minimize confusion. A good example of this is Gmail, where the same terms are used as client mail applications like: E-mail, Drafts, etc.

**Error Prevention**
Correcting errors is important, but why correct mistakes if they can also be prevented? A good interface design can prevent mistakes and minimizes them as much as possible.  for example when searching in google search for example, it gives recommendations, which prevents mis-spellings.

**Recognition rather than recall**
Users should have to remember as little as possible. If users have to remember a lot to make sure that the interface can be used properly, it is not very user-friendly. Instructions on how to use a system should be visible or easily retrievable. For example in coding software, certain coding appears in a drop-down menu which makes the recalling of most codes more easy.

**Flexibility and efficiency of use**
Expert users should be able to use the system more efficient, which can be achieved by making use of accelerators in the software. Shortcuts in Photohop or InDesign is a good example of this. Novice users can use the software quite well. But experts can use the shortcuts to quickly navigate through the different tools in the software.

# 2. Literature Research

**Aesthetic and minimalist design**
Unnecessary information should be eliminated from the interface, every extra word or piece of unnecessary information causes more indistinctness of the important information. It is important to realize what information is important and what is not, to maximize the efficiency of the interface.

**Help users recognize, diagnose and recover from errors**
Error messages should be expressed in plain language (not in codes), the error message should help the user understand the error and recover from this in a clear way.

**Help and documentation**
The ideal interface can be used without help and documentation. It is nearly impossible to design the perfect interface. Help and documentation may be needed for the user to make clear what actions have to be done in order to realize their goal.

# Applying the frameworks

For this assignment, four frameworks have been looked into. Service-Dominant Logic is the way of looking at the market in a way of exchanging services instead of looking at the market as an exchange of goods. This is not specifically being conducted in the project in a literal way. It is a way of thinking about the subject in a way of service provision and receiving. LochemEnergie provides a service which makes it possible for customers to rent a car for a short period of time when they need one. Customers can cheaply have an extra car available if it is needed, which for some families makes it not required for them to buy an extra car. The system that is going to be designed in this project will provide an extra service for the customers by making the reservation process more user-friendly, enhancing the service. The service the customers exchange is an indirect one, which is money. It is indirect because money on its own doesn't provide a service, rather it is something that can be indirectly exchanged for another service. Taking this into consideration, there should be taken in mind that the goal of this assignment is not to create a system, or an application per se, but a service which provides an easier way of car reservation, payment and management for LochemEnergie.

The 6th Foundational premise of Service-Dominant Logic states that 'The Customer is always a co-creator of value'. This implies that value creation is interactional and that value is not created by the supplier, but by the interaction of the supplier, the service provided by the supplier and the customer that gets value out of the service provided by the supplier. The implementation of co-creation in this project is done in a way of interacting with customers to create an idea of value-adding functionalities that could be implemented in the system that is going to be designed. Sessions with customers that enhances the understanding of the customer's wishes should be done to maximize the value that the service.

Voice of the customer is the way of capturing the customer's requirements. This can be done in many possible ways of information gathering: conducting a survey, individual interviews, focus groups etc. could be conducted to catch the costumer's thoughts of the product that is designed. In the context of this assignment. Voice of the customer will be implemented in taking a survey which is going to ask the customers the basic needs of the electric vehicle renting process as it is done at this moment. Then, interviews will be held with individual customers to ask how they look at the current process of rental, letting them give their negative and positive feedback, and to get an idea of the improvements that should be taken into account with designing the application.

The ten heuristics of Nielsen should be implemented to ensure that the design is friendly in use and that the design is as efficient as possible for users to use. During the design steps, these heuristics will be implemented.

# 3. Analysis

## Survey

In the first stage of the assignment, a survey was conducted. This was before the current process of electric car rental was known. Therefore the survey was not focused on the design of the new app, but more in a way of getting information on the whole rental process and the use of electric vehicles as it is now. The survey was sent to the member of LochemEnergie, which is a pool of around 500 people, and there were 60 useful responses. In the first place, questions were asked about the use of electric vehicles and the need of it. The questions were directed to the possibility of replacing a second owned car with an Electric vehicle from LochemEnergie. Secondly, questions were asked about the satisfaction of the customers about the Electric vehicles and the rental process overall. Another part of the questions was about the vision of the customers about the future of electric driving and if this is a solution to reducing pollution. Furthermore, questions were asked about the implementation of the project as it should be organized in the future. In the end, questions were asked about the availability of electric vehicles and when the customers would like to rent the vehicles. In the end, the required information that the customers would want in the app will be treated and the price the customers would want to pay is estimated.

Conclusions

As can be seen in the results of the survey in appendix A, the result of question six states that half of the respondent never have rented a car with LochemEnergie, this doesn't mean their answers aren't valuable though, as they may state what their reason is to not rent a car and can give us valuable information on how to improve the current situation. Results of questions 7, 8, 9 and 10 show that most people have a car, and half the respondents have a second car available. Of these people, half of them could replace this second car with a rental car from LochemEnergie. Out of the results of questions 12-20 can be concluded that overall, there is a positive opinion about driving electrical vehicles and there can be seen that the customers of LochemEnergie overall think of electrical driving as the way to go in means of personal transport. In questions 21-26, there was asked on what level the respondent would like to engage in the project and if they would adopt a car with a group of people. A quarter of the respondents would like to play a part in the organization of the electrical carsharing and 17 % of the people would not mind having a car on their terrain. Also can be concluded that most people prefer to not share a car inside a group of people, some people do not mind sharing a car in this manner, but most people prefer to rent a car as an individual. When looking at the answers about when the customers would like to rent a car, there can be concluded that most people don't have a standard day when they would like to rent a car, most people randomly rent a car when it is necessary. Another thing that can be concluded is that very little people would rent a car in the weekend.

When asked about the things they would want more information about, several suggestions were made, the most useful ones are that the availability of the cars should be seen directly. Instead of waiting for a day, the customers should be informed immediately if the car is going to be available at the time they want to rent it. Another suggestion is to implement a tool that makes it possible to see the availability at that moment (the real-time availability). Also the price of renting the cars should be seen immediately. Another suggestion is to implement a function that gives a suggestion of another car that could be rented if there is no car available in the desired period. Other suggestions were to show the battery status on return and the flexibility in hours to return the car.

The last part of the survey was to estimate the prices that the customers would like to pay for renting a car. The results of the average prices are shown below, with the suggested amounts behind them.

One day part (1-4h):  €9,84 (€12,00)
two day parts (5-8h): €17,33 (€20,00)
One day (9-12h): €21,36 (€25,00)
Four times a fixed day part / month: €44,70 (€60,00)
Four fixed days /month: €65,58 (80,00)
Flexible, 4 random day parts: €35,75 (€40,00)
Flexible 4 random days: €52,66 (€60,00)

Overall, half the responses were that the suggested prices are allright The other half said that the prices were too high. Nobody said the prices were too low.

# 3. Analysis

## Interviews

A couple of interviews were conducted with customers. In these interviews, the reservation process was split up in six parts: overall, reserving the vehicle, picking up the vehicle, driving the vehicle, bringing back the vehicle and the application. The Interviews can be found in Appendix B. The following conclusions could be drawn from these interviews:

Overall, the reservation process is experienced as fine, but some features are not as efficient or user-friendly as they should be. The reservation process is considered not very user-friendly. The main reason for this is that the availability of the cars cannot be seen. One day after reserving, a mail will be sent to the user confirming or denying the availability of the car. This is considered very annoying, because this will cause a lot of puzzling when the car is not available to arrange another form of transportation. The users would like to be assured that the vehicle is available right after finishing the reservation.
The mails sent as a confirmation are not very clear. One customer said, as the mail names the date the reservation is done and not the date of the actual reservation, this caused some confusion and this should be made more clear in the future.
There was also pointed out that there cannot be chosen to select more parts of the day, for instance the afternoon and the evening. The customer therefore could not use the service as much as he should have wanted.
Another irritation is that the information is not stored. So with every single reservation, the same questions have to be answered and this is quite a big list. It would be nice if the customer can log in with his own account and LochemEnergie already has most of the information stored.

Picking up the car has some downsides as well. The key has to be picked up at a family and people have to be bothered to get the key and drop off the key. This was quite encumbering for some customers because they do not want to bother other people. The location which has the locker is said to be preferred by one of the interviewees, as no people have to be bothered at that location.
Another small downside is that, especially the first time, the process of plugging out the vehicle can be unclear, because this is for a lot of customers a new phenomenon. If this should be explained more clearly, this would be nice. The customers said that after the first or second time, this is not a problem anymore.

Driving the car does not come with any problems. The interviewees said that only some extra functions like a TomTom or cruise control would be nice. These are no real problems we are going to address in this project.

Bringing back the car has the same difficulty as picking up the car because plugging in the car is a bit confusing in the beginning and bringing back the key can be a bit bothering. When knowing the family a bit better, the key can be dropped in the mailbox, but this is still not optimal.

Most interviewees said the payment system is fine as it is. They do not have to do anything but check a checkbox to agree with a single direct debit. It would be nice if they can review their past payments though, and the prices of the reservations should be visible.

When asked about the usefulness of the app, every interviewee agreed that a reservation app would be very useful for LochemEnergie as reserving through the website is a bit tricky and this could be improved with the use of an application.

# Paper Prototyping Session / Event LochemEnergie

During one of LochemEnergie's events, a paper prototyping session was planned. The occasion was the concluding meeting of the IPIN project, where the electrical vehicles where a part of. Many people that were involved with this project were present and a lot of the customers of the electrical vehicle program were there as well. In the afternoon there was an event with many different presentations and speakers who all presented a different story regarding the IPIN project, as also the electrical vehicles were discussed. After the presentations there were five tables assigned to different subjects. One of them was EV. The attending people had the chance to go and talk about these subjects at the respective table. The setup of the table can be seen in the image below.

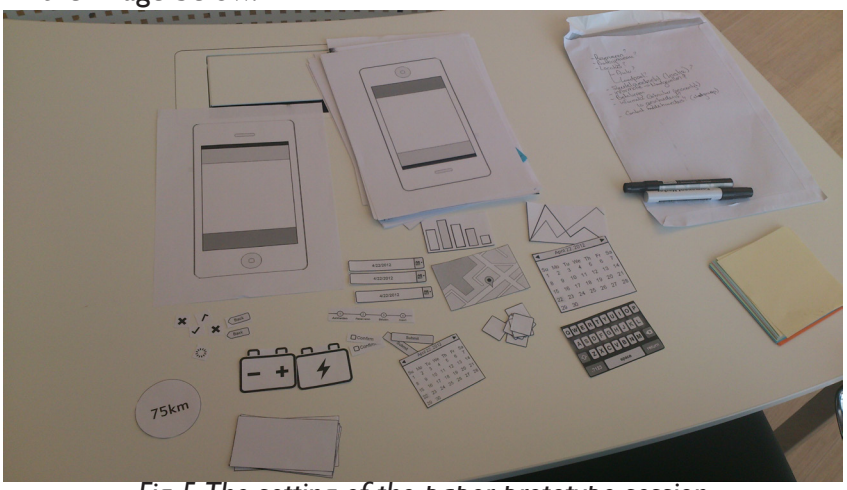


*Fig 5. The setting of the paper-prototype session*

Customers could go and talk to one person who is involved with this project and one person who is involved with the reservation process of the last year. The user had the possibility to give their comments on the upcoming plans on building a new system, the reservation process and averything involved with this. The suggetions people gave can be seen in the IMAGE below.

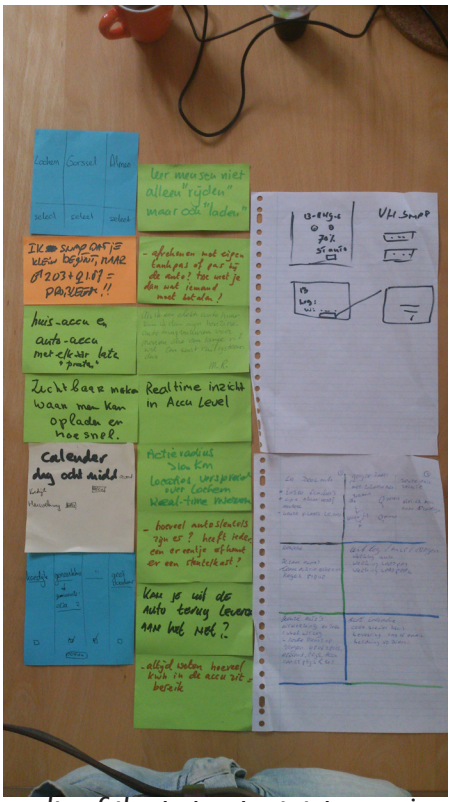


*Fig 6. The reseults of the paper-prototype session*

# 3. Analysis

## Research Can Okur

Research is being done at LochemEnergie for the rate of acceptation of users of this new technology of electric driving. Electric driving is a fairly new technology and most people have not driven in a electric vehicle. Can Okur, a student Human Factors and Engineering Psychology at the University of Twente, is researching this subject at the moment at LochemEnergie. The research is being done by surveying and interviewing two groups of people, an experienced group of electric vehicle drivers and an unexperienced group of electric vehicle drivers. The users in Lochem have already experienced a year of electric vehicle driving before the measurement started. A new group of people in Gorssel had to be set up for this research. These people had no experience at all with driving an electric car. In a time span of eight weeks, six measurements, of both groups, were taken to look at the rate of acceptation of the new technology, if the fear of reach of the car is changing overtime and what the positive and negative feelings are for the customers. The fear of reach is especially the case with electric vehicles because of the battery of the car. The number of kilometers you can drive with a car depends greatly on the circumstances you drive in. In perfect conditions for example, you can drive 120km on one battery. But in the winter, when it freezes, you have got headwind, drive on the highway with the radiator on full power, this will be significantly less, around 50km.

The results of this research are that the acceptance of this technology grows when it is used more. The acceptance of the group in Lochem was a bit higher than the group in Gorssel. The fear of reach was a more varied measurement. This opinion differs greatly between the different users, but on average, there was a difference between the groups as well. The uncertainty of the unexperienced group grew, as the uncertainty of the experienced group became lower. A conclusion of this is that the uncertainty can be seen as some kind of parabola, where there are three stages: First there is the confidence of driving like a normal car, Secondly, they experience that the battery management is quite difficult, and some users even drain it completely and become stranded, this raises the uncertainty of the users. But after a few months of practice, there is a moment of clarity where people know how they can and cannot drive with the car. They know that they can drive from Lochem to Deventer for example. But a trip to Utrecht is too far away and cannot be reached without recharging.
The opinions of users were also observed by interviews that were taken, thanks to this, several conclusions were drawn. They can be divided in three groups, happy, neutral and not happy.

**Happy**

- Costs of renting a vehicle is quite cheap, when owning a car, it will cost you a lot of money, buying a car, petrol, insurances, taxes. It will result in about €200,00 per month in costs. With renting a vehicle, this will be a lot less, because users will only pay for the car when they use the car, this is now only €5,00 per day part or €10,00 for a whole day. If you only need the car for two days in a week, this will only cost you €80,00 that month. This is considerably less.
- Mobility is another positive point of renting these vehicles. Users think that it is very useful that there is the possibility to rent a car for only a part of the day. If the husband for example goes to work with the family car, the wife can always rent a car and her mobility will not be as reduced as before.
- Another great pro is the sustainability, the goal of LochemEnergie is to create and use more sustainable energy and the customers of LocheEnergie often have the same mindset. Many customers think that it is very important.

**Neutral**

- The reservation system at the moment works, but it is far from perfect. A customer has to reserve the car two days in advance, then has to wait one day and only the day before the user needs the car, he or she hears if the car is available that day. If this is not the case, the customer has to arrange for another way of transportation, which could be difficult. When the car is available, the customer has to go to a location to pick up the key and sign an agreement. Then the customer still needs to go to the vehicle. This process is very inefficient and time-consuming, which surely is a reason for some to not rent a car at Lochem Energie.
- Lochem Energie only has Smarts driving around, which have two seats and therefore cannot have more than two people in it. This is in some situations not enough. It would he positive if Lochem Energie can offer multiple types of vehicles.
- Insecurity also plays a role for users because there is no certainty that the reservation is viable until the day before.

**Not Happy**

- Reach is something people really think of as a disadvantage in comparison to petrol cars, where people can drive hundreds of kilometers on a full tank, they can now only drive one hundred kilometers on average. That this amount is variable is also a great disadvantage because it causes some good estimations based on the weather to know how far you can drive it (without recharging).
- The infrastructure of charging stations is very bad. The consistency of presence of charging stations is not so good in some areas as others, So it could happen that the battery is almost empty, but there is no charging station nearby. At the moment there is a card needed for making use of the charging stations. These problems are known by Alliander and Allego and they are working on solutions to make the situation better. For example, the card that is needed for making use of the charging stations is being replaced by an application.
- Pickup and bringing it back is also considered a major flaw. This is already treated in the part about the reservation system. It is too inefficient and time-consuming. One of the tasks of the assignment of this thesis is to tackle this problem.

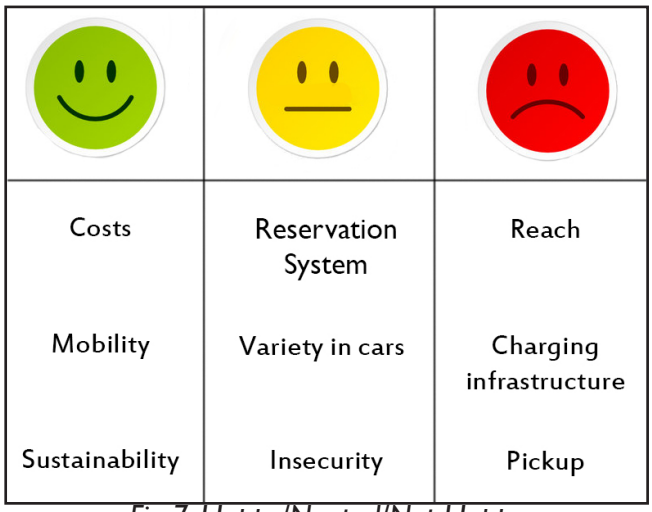


*Fig 7. Happy/Neutral/Not Happy*

# 3. Analysis

## Project Charge&GO

Software for carsharing already exists, but for the specific application of electric vehicles not though. The renting of electric vehicles can only be done if the battery level is compatible with the desired amount of kilometers to drive. The use and rental of electric vehicles can be optimized, and can result in lower costs, if all relevant information is automatically analyzed.

For achieving this goal, project charge and go is initiated. This is a project with several partners in which three main partners are involved: LochemEnergie, Allego and Casemaster Solutions. Allego is the provider of charging stations, LochemEnergie is the company which is the link with the users and Casemaster Solutions is the IT Company which is going to build the back- and mid-office systems. This is where all the different streams of data are processed. LochemEnergie is then able to use this information to build an app which their customers can use. The back office system will be able to adjust for use by other companies so that this system can be sold and is eventually profitable. Therefore, it must be suitable for at least a carsharing pool of 50 cars. This also reflects the desire of LochemEnergie to grow as a carsharing service.

# 3. Analysis

## Market Research

**Snappcar**

Snappcar works as follows: In the Netherlands, on average, cars stand still for 23 hours a day. The owners of Snappcar think this is very unnecessary. With Snappcar, you can rent cars from other car owners. Just register and you can rent out your own car or you can rent somebody else's car. You can search for a car nearby, propose an arrangement with the car owner and drive. The cars are insured, there is 24/7 help with repairs and it is very cheap this way. This service doesn't make use of electric vehicles though

**Car2GO**

Car2Go is a subsidiary of Daimler AG. In European and North American cities, it provides carsharing services. The company started out in 2008 in Ulm, Germany and grew a lot. Today it operates in 29 cities worldwide (Amsterdam is one of them) and it uses around 13.000 vehicles. It has over 1.000.000 customers, which makes it the largest carsharing company in the world. The company has an innovative rental system. Originally when a car is rented, you go to a centralized rental office, where you pick up the car and drop it off when you are done with it. Car2Go offers one-way point-to-point rentals, with which you can pick up a car everywhere in the city and drop it off everywhere as well. The location of the car can be found with a downloadable smartphone app. The customers are charged per minute, with hourly and daily discounts. Per city, or country, these rates and discounts differ, due to the economical differences. There are special designated parking spots all around the cities or the cars can be parked in standard parking area's which is permitted by the local authorities. Car2Go rents both gasoline powered vehicles and electric vehicles. With the app the customer can see the vehicles fuel gauge or the vehicles battery state. With this information the customer can select a proper vehicle for the trip he is going to make. By refueling/charging the vehicles, the user can earn free minutes.

**MyWheels**

Mywheels is a similar company to Snappcar. It is also a non-profit company and its goals are to make traffic more eco-friendly by reducing the cars that are necessary.
It is possible to rent out your own car to other people. This way, less cars are needed, and/or are standing still.

**Uber**

Uber is quite a different sort of company. It does not rent out cars, but offers a service with which people can submit a trip request, it is routed to crowd-sourced taxi drivers. This formula proved extremely successful and it is estimated to generate a revenue of 10 billion dollars by the end of 2015 there has been a lot of protest against Uber, alleging is its use is illegal and unsafe.

**Lochem Energie**

In this list, Lochem Energie has the goal to compete with the others, in their own respectable region. Lochem Energie now only rents out electric vehicles in the municipality of Lochem.

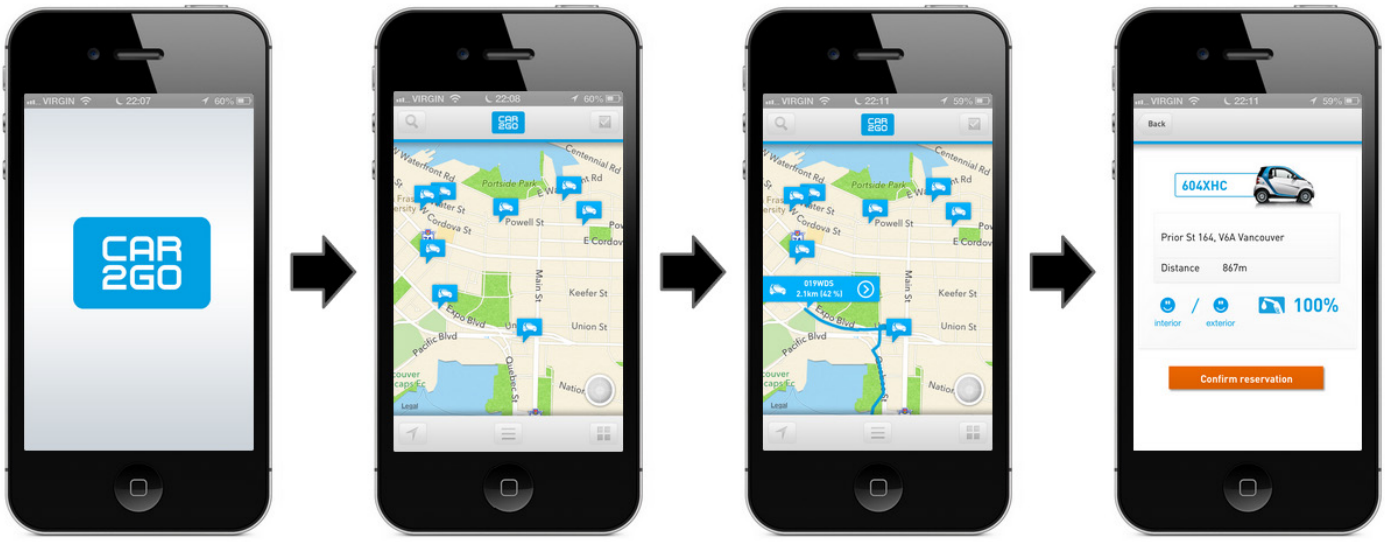


*Fig 8. Screenshots Car2Go*


*Fig 9. Screenshots Uber*

# 3. Analysis

## Programme of Requirements

**Overall**
- Every user should have its own account
- User information should be linked with database
- The system should remember user-information.
- The system should be linked to the administration of LochemEnergie
- There should be some kind of service desk/telephone number
- Inform the user of where to park/how to charge etc.
- App is usable for organizations with different amount of cars.

**Reservations**
- Users can reserve a car for parts of a day
- Users can see the availability of the cars
- Users can select more flexible timeframes.
- Costs of reservation can be seen directly when selecting an option
- The reservations agenda should be closed (not to be changed by other users)
- The reservation system should take into consideration that there are multiple cars that can be rented
- The system should confirm the reservations

**Payment**
- Payments should be made more easy for the treasurer to process.
- Users should be able to have some kind of archive or history of earlier payments/rentals
- There should be possibilities for subscriptions etc.

**Key transfer**
- App should inform the user of how and where to unlock the car

**Charging battery**
- App should inform the user of the battery status (Number of km to drive)
- App should inform the user if battery is nearly empty
- App should give suggestions of where to charge

**Wishes**
- A chat function available for sharing groups.
- Linked with other project in and around Lochem (Sponsors/hotels/tourism)

# 4. Functionality

## Casemaster Solutions

For developing the software, LochemEnergie chose to cooperate with Casemaster Solutions. Casemaster Solutions is a company specialized in developing software that supports data streams inside companies. Casemaster Solutions utilizes their own system-building platform, a toolkit they created themselves. With this tool, data-processing systems can easily be built and used. In this project, there was a lot of cooperation with this company to make sure the app can connect to the data system. The data system is going to process the customer database, the reservations that are going to be made, the subscriptions, the data of the vehicles and all other data.
The difficulty of cooperating with Casemaster Solutions is, that they are only specialized in back- and midoffice software applications, not on the front end software, which is the interface that the users are going to use. This means that the app will have to be adjusted to the capabilities of Casemaster Solutions. I will discuss more of this later.

## Development in phases

As said in the previous paragraph, Lochem Energie found a partner with which they are going to develop the application. This partner is Casemaster Solutions, a team of experienced IT-professionals located in Lochem. Casemaster Solutions does not have experience with building apps. Whether it is going to be a web application or a smartphone application is a question that has to do with the capabilities of Casemaster Solutions and the budget available for developing the application. They have got some experience in building android applications, but none for the other operating systems. What they can do, is building a web application, possibly scaled into an application that links to the web application.

Partly because of this, the development of the application has been split into multiple stages. Each stage has its own deadline and will be improved with more advanced functionality. Lochem Energie wants the application to be working as soon as possible but Casemaster Solutions cannot provide the most advanced functionality in this app in such a short period. Therefore, the first stage of the app is planned to be finished in August 2015, with the most basic functionality. This will be an application that opens a web application on the smartphone with the desired functionality. The eservation system will be functional and will have personal accounts for each customer. This will also make it possible to imlement subscriptions and reserve cars at fixed timeframes for customers, for instance, someone can rent a car every Monday morning from 8:00 to 13:00 and doesn't have to worry if the car is available or not. This version will also make it possible to get immediate feedback if the car is available or not, instead of having to wait for an e-mail from someone of Lochem Energie.
The car key will still be given away by the family that also does this now. It will not be able to insert a function into the application that replaces the key as it is exchanged at the moment. This will be done in a later version of the app.

The second version of the app will have a feature that links to the decentralized charging squares. These charging squares are not implemented in Lochem just yet but this is a possible feature for the future (possible second version of the app). Also the link with the production of the solar parks of LochemEnergie will be made. It will also be made possible that private cars ben be rented out among customers (like uber). Another function LochemEnergie wants to implement is to create a link with charging facilitations at the homes of the customers.

The third version of the app will implement the cooperation with Allego and Alliander, as the platform of Motown will be integrated and a fuction to integrate the insight of the load on the electricity grid will be made visible. These are functions that require a good cooperation with these companies to look at what information is neccesery, required and on what terms this will be done.
Because this is not yet decided, I will only moderately discuss this functionality.

Later on, these functions changed, as some functionality was ought unattainale.

# 4. Functionality

## Native-, Hybrid- or Web Application

Because Casemaster Solutions does not have the proper skills to build an application for Android, as well as iOS, let alone Windows Phone, the decision has to be made as how the front-end software is going to be built. In consultation with Casemaser Solutions, three options are available: Making an iOS and Android application, building an application that functions as a window to support the use of a web application or just building a web application.

Building a full iOS and Android (native) application is most preferable, this supports the most functionality of all options, because it is able to make use of all the functions of the phone, like the camera, gps etc. It creates the best user-experience because the app will work a little smoother because the data doesn't have to go through several layers of software like a web application. The downside of this option is that the application cannot be made with the skills of Casemaster Solutions. Therefore, a third has to be hired to build the software. This will cost a large amount or money as these programmers ask a lot of money (€80+/ hour) for the service they provide. To build an native app will be very costly and will possibly not be able to fit in the Budget of LochemEnergie. Another downside of this is that the application and the back-office will have to be maintained separately.

The second options is to build a hybrid application which makes use of a mobile application to open an web application. This is a very small app with not a lot of functionality. This way, the application can mostly be developed by Casemaster Solutions in Casemaster®. Most software required to make the system work can be developed with in-house expertise. It won't be able to access the phone's functions except that the gps location of the customer can be measured at startup. There will be external costs for one time only and this will be a lot less than building a full functional app.

The last option is to build just a web application that can be opened in a browser. This is a website which is designed only for relatively small screens on a mobile device. This can easily be built with in-house expertise of Casemaster Solutions and can be linked very easily with the data-system. When using a webapplication, functions of the phone can not be used, because of privacy-regulations. The advantage of this is that it is very cheap to produce and there are no challenges with different versions.

There is chosen to build the app as a hybrid version for now. For the first version of the app, all of the functionality can be integrated and most software-development can be done by Casemaster Solutions. Buiding a native app will be too expensive for LochemEnerie to realize as for now, maybe in a later stage this could get implemented to enhance the user-experience. Building a hybrid application is the best alternative, as the system is still able to be used as an app and the webapplication that will be linked can be built by Casemaster Solutions.

# Reservations

The main goal of the new system is going to make reserving a car easier. As can be concluded in the results of the interviews and the survey, the customers would like to know the availability of the car as soon as possible, if not immediately. If there is no car available, a suggestion should be given. Another suggestion was that the price of the rental should be showed as well, especially from the results of the survey can be seen that this is an important feature customers would like to see.

Several variants of reservations can be distinguished, as there will be different kind of users: Free renters, main renters and subscription holders. Free renters are customers that do not have a subscription. These customers do not often rent a car but once in a while need a vehicle. These reservations can be done for every moment available. The price of renting vehicles at a certain amount of time is not decided yet. The results of the survey indicate a price of around 10 euro's for +- 4 hours and 25 for an entire day.

Another type of renter will me the main renter, these are customers (individuals or companies) that pay for the vehicle to be available at standard periods of time, for example, every Monday morning. These cars will then be available for the customer every Monday morning at for a lower price than normal. LochemEnergie thinks it is important that when the customer does not use the car even when they have this subscription, the car can be used nonetheless by another customer. This can be done by going in the overview of reservations and cancelling the desired reservation. Another option of doing this was to let the customer confirm the reservation two days before the car is used, and if this is not being done, the car's status will be set to available again, making it able to be reserved as a free rent. The reason this isn't the ideal solution is that customers, especially older people, could forget to confirm their reservations and this will cause people to lose their reservation. People should not have to think about this every time a car is rented with LochemEnergie.

Not everyone will want to rent a car at fixed times, as can be seen in the results of the survey, between 70 – and 80% of the customers of LochemEnergie do not need a car on fixed days. To provide an alternative subscription for these users, flexible subscriptions should be available as well. This means that for a certain amount of money, lower than the original price and higher than the fixed subscription, the user should be able to rent vehicles multiple times per month.

For reserving cars, information is needed. The first one being the date and time of the reservation, secondly the City where the car is reserved, the location in the city the car is reserved and possibly the number of kilometers that is going to be driven. This information should be given by the customers, but it is now important in what order the information is needed as to design the reservation process.

# 4. Functionality

**City**
The city where is going to be reserved is necessary. The users of the app all live in one of the available cities and there is assumed that the customers that live in Lochem for example, also reserve a car in Lochem. This results in the conclusion that only one piece of information is needed from this category, which is the city (Lochem, Gorssel or Almen), multiple cities cannot be selected. When Lochem expands, more cities can be added.

**Location**
In Gorssel and Almen, this piece of information is not necessary yet, as there only is one location in both cities. For Lochem though, there are three locations: Koedijk, Town Hall and Heuvelenweg. Customers sometimes wish to pick up the car from a desired location, but for some customers, this is less important. Therefore, it should be possible to choose between several locations.

**Time**
With the current situation, people can rent the car for a day, morning, afternoon or evening, not multiple. The price of the full day is double the price of the day part. When the car is reserved in the morning, and someone else needs the car for the afternoon and the evening, the car will be not available. The customer cannot rent the car for both the afternoon and the evening and also not for the entire day, because the car is already reserved in the morning. This has to be done differently, therefore, there are two possible options to work with: Stepping away from the periods and work with hours, or add options to reserve multiple day parts.
When using the three periods, the management process of the reservation is a lot easier, but it will make it unable to reserve a car when needed from 11:00 to 14:00 for examle. These times are part of two periods and will be extra expensive as the customer will be charged for two periods.
The other option is that reservations can be done from and until a certain hour. This makes it possible to reserve the car very flexible, which is great for the customer. This will make the process of car reservations a little more complex as the hours have to be stored in the system as well. Because of this, the subscriptions should be adjusted as well, because the subscription periods do not apply with this situation. There has been chosen to use the system of reservations based on hours, as they are more flexible and it is a little more conventional. There has to be taken in mind though that to provide the customer with a full car, there has to be a charging period of one hour between reservations.

**Number of kilometers**
The number of kilometers can be used to assign a car with the right scope. When someone only has to drive for 40 km, a car with a low scope can be assigned. This way, the cars with a higher scope will stay available for the customers that have to travel longer distances. For now, this is not necessary as there is no big difference between the different type of vehicles.

The order of the necessary information can differ though. This can be seen in Figure 10.
There is chosen to implement the City>Location> Date/Time>Car option in the prototype. It would be a good idea to do more research on what order the customers prefer.


*Fig 10a. City>Location>Date>Car*

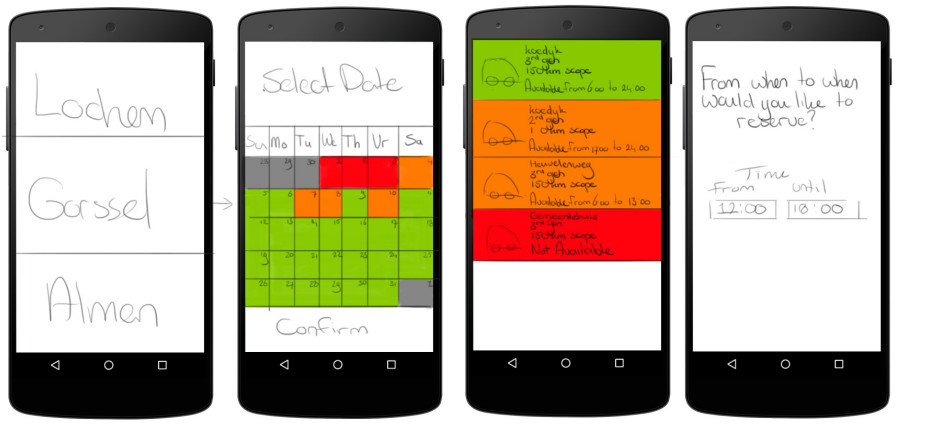


*Fig 10b. City>Date>Car>Time*

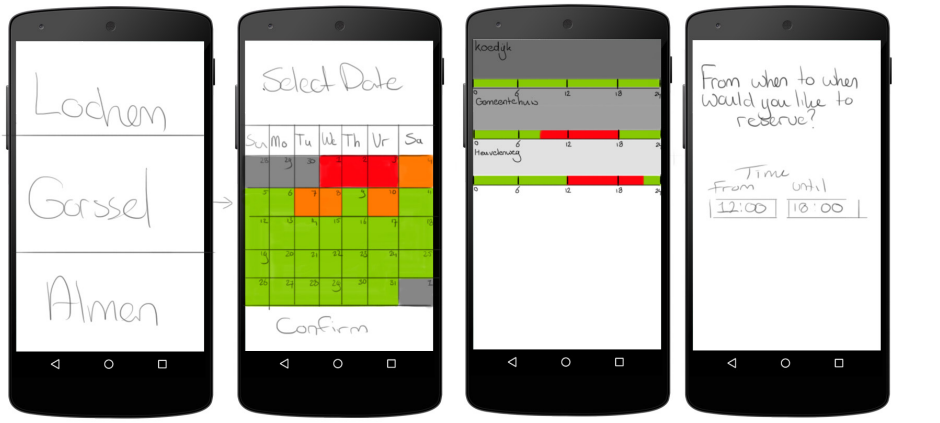


*Fig 10c. City>Date>Car2>Time*

# 4. Functionality

## Key Transfer

The application should inform the users of where they should be getting the key from. In the current situation, the users have to go to a family to get the key. They have to ring the bell and receive the key from this family. From the interviews, there can be concluded that some people see this as a disadvantage of the current situation, because they don't want to bother the family this much, they feel burdened. At the town hall, the key can be gotten from the reception and at the Heuvelenweg, there is a locker that can be unlocked with a code to get to the key. In the future, more of these lockers will hang close to the charging spots of the vehicles. This way, the customer can easily get access to the key when needed. These lockers need to be opened with a code. This code will be displayed in the app.

## Car locations

There are six cars used by LochemEnergie, four of them in Lochem and one in both Gorssel and Almen. In Lochem the four cars are divided at three locations: The Koedijk, the town hall and the Heuvelenweg. These locations can be seen in the image below. The locations of the vehicles may change over time and more could be added, this must be kept in mind when designing the app.

The position of the car may also be tracked, this can be done with a device already inserted by Mercedes and can be accesed with an app provided by them. The location is tracked by sending the gps-location to the database of making use of cellular of satellite networks. This would be great for checking where the car has been and if the car is nearly back yet, when the time of the customer is running out. Unfortunately, this cannot be applied in the app for LochemEnergie for now, because LochemEnergie does not have the rights for this information.

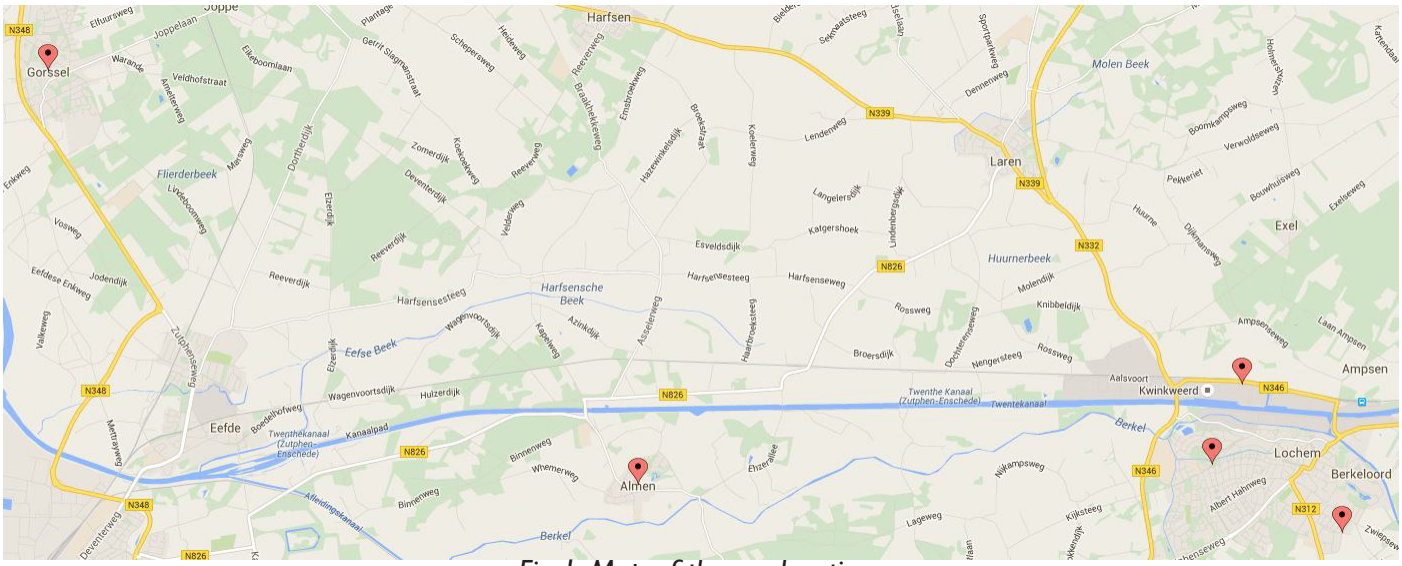


*Fig 1. Map of the car locations*

# Payment System

In reservation systems like these, there are many payment systems that can be used. The easiest one is to direct debit the amount from the customer's bank account. The customer only have to agree that LochemEnergie will get the permission to do this, and after this is done, the treasurer of LochemEnergie can send a special file to the bank with the name of the customer, the title of the payment, the bank account number and the amount that has to be paid plus some other details. After this is done, the amount will automatically be charged from the bank account of the customer. This is the cheapest and easiest way to charge customers. The software behind the reservation system can easily keep track of the reservations and can link them with the appropriate customers. The only thing that has to be done is the extraction of the file, out of the system and send it to the bank. The file probably can be automatically generated out of the system and does not even has to be changed or adjusted by the treasurer. This may differ depending on the bank. The downside of this is that payments can be rejected by the customer and the money can be deposited back to the customer's account.

Another option that can be used is making use of iDeal. This is a license that can be bought from the bank that is used and this makes it possible for people to pay by bank card. The way this works also varies between banks and we will not go into depth on the different ways. The advantage of this is that the money is paid before the service is provided by LochemEnergie. The disadvantage is that it cost quite a large amount of money. The connection charges are €100,00 and the monthly costs are €20, above that, every transaction will cost Lochem Energie a small amount of money (€0,40). The amounts may differ between providers.

Payment by credit card can be implemented as well. This can be requested by the bank bank as well. There are no connection charges when requesting this service, but there is a certain percentage of money charged with every payment, this differs somewhere between 2% and 3%, depending on the card used, the type of company and the payment method.

Also some third parties can be involved like PayPal. This is a service that works like a digital bank account. An account can be made and money can be deposited and withdrawn from the account. The charges for this are 3,4% + €0,35 per transaction or less, depending on the situation (profit, non-profit etc.)

For LochemEnergie most of these methods are not very useful. There aren't that many transactions yet (500 last year, 60/month) and this can be easily administrated by the treasurer with direct debit. As said above, this is the cheapest method there is, without transactions going through third parties. If LochemEnergie grows though, and the amount of transactions is going up, the choice can be made to add one or more of the other payment methods. For now, the other methods would be like using a sledgehammer to crack nuts, or as the Dutch say: "Shooting a mosquito with a cannon".

When there is being charged on the go, there will also be costs. This is now paid by LochemEnergie itself. Every month, the treasurer of LochemEnergie will receive an invoice where this is specified very clearly. The date, card number, time and amount are being clearly displayed. The treasurer of LochemEnergie can then import this information into the system and this can link the dates and times with the corresponding customer. This way, LochemEnergie will not have to pay for this themselves.

# 4. Functionality

## Charging (Stations)

Electric cars have a limited scope. Depending on the driving style and the weather conditions, the scope is different. The same car that drives 130km on a warm summer day and is not driving over the highway, can only reach 70km when driven on the highway in midwinter. This difference is due to how the battery of the car works. This requires some experience with electric driving to get used to. Because driving electric vehicles is an upcoming technology, most people do not have this experience, which can result in some miscalculations of the distance that could be driven. Users might need help managing the battery level to prevent the battery from fully draining. This would be quite unfortunate because nothing can be done to charge the vehicle if it is not near to a charging station. When this happens, the car has to be towed away and LochemEnergie will charge the customer €75,- .

This problem comes with another difficulty though, because charging facilities are not as present as they should be. This is of course, because not a lot of people are driving electric vehicles yet and it is a very new technology. At this moment, a lot of work is being done to improve this situation. For now, the user should be helped as much as possible to prevent the battery from going empty.

**Applying in Application**
Because of the users being inexperienced, they should be informed, the longer the customers use the electric vehicles, the more accepting they become of the technology, this is one of the conclusions of the research of Can Okür. There are a few ways of helping the customers with this: displaying the battery status, displaying the estimated number of kilometers and to inform the customer on the presence of charging stations.

Displaying the battery status requires information/data from the vehicle. This cannot easily be gotten. The cars LochemEnergie use are leased and it will not be possible to install a device that can read this information from the vehicle. This should also not be necessary though, as the provider of the Smarts (a subsidiary of Mercedes) had already such a device installed, with a complementary application. With this application, a lot of information can be gained. There should be pointed out that this app is not fully functional yet, but it can be utilized with the web browser (it is still a web application). It would be great if this information could be obtained and read by the data system. This might be possible if LochemEnergie makes some kind of arrangement with Mercedes, but as this is not the case yet, this cannot be reckoned with. Because we cannot be sure that reading out this information is possible, giving an estimate driving distance is also not possible, since the battery level is required for this to be done.

The presence of charging stations is the second functionality that can help the customers of LochemEnergie prevent fully draining the battery. To do this, two things are necessary: a database of charging locations and a licensed map (like Google Maps). There are already multiple services that provide this function, like NewMotion and www.oplaadpalen.nl. For this to integrate in the application of LochemEnergie would provide a neat feature for users, and it will provide a nice, user-friendly situation as they don't have to switch applications or have to go to the internet. But this is not easily achievable for LochemEnergie, as this app is mainly for reserving vehicles and it is required for users to log in to the app because information necessary for reserving is personal. This makes it impossible to make use of Google Maps, because the requirement for using this is that is not being used behind a password.

As a conclusion, not a lot is achievable for LochemEnergie, considering the budget of LochemEnergie and the technical possibilities / information provision for developing this function as well. Because of this, there has been chosen that such a function will not be implemented in the app, as is not realistic considering the current situation. There will be a submenu that links to Newmotion and oplaadpalen.nl to provide the user with a solution if necessary. Important is that the user should also be informed that the current types of vehicles cannot be charged with fastnet.

*Fig 11. Charging the electric car*

# 4. Functionality

## Emergency Contact

Several emergencies could happen when renting an electric vehicle. Because of the inexperience of driving an electric vehicle, it can easily happen that a customer overestimates the battery life of the car and so the customer can strand during the trip because of an empty battery. Of course, other difficulties could happen as well. In these cases, customers should be able to contact an emergency number. This contact can arrange a tow truck or some other solution. LochemEnergie works with a lot of volunteers and does not have (a lot of) paid employees. A standard contact person will be hard to find because of this. The solution for this is to find a couple of volunteers who will take on this task together. All of them will function as an emergency contact for a (few) day(s) per week. In the app, these emergency contact numbers can be changed considering who is on duty that period. These different contacts can be displayed and will be changed in the application using the data system that works behind the application

## Pop-ups

Certain pop-ups should be applied on the app. This could be done as a reminder of the reservation to make sure the user remembers that a car is rented. This will ensure that the user will not forget to pick up and use the car. It will be useful to also inform the user to look at the instructions of the vehicle that is going to be driven. It is an option to show this pop-up with every reservation, because most people rent a car a few times per month. It is of course questionable if this is useful every time a car is rented, but is should be done every time a different type of car is rented to make sure that the customer has the information about this new car. The actions to charge or drive cars is different for every type of car and users should be aware of this.

Other pop-up messages could be used when the customer is too late. Because the car has to be charged for a possible next reservation, the car has to be back in time. The user can be informed when he is almost running out of time. For this function to work, some sort of data has to be available of the location of the vehicle, or information on the charging stations being connected with the car. This is not possible yet. An other option is to always remind the customer when the rented time is almost over, wheteher he already brought the car back or not. If something is arranged with Mercedes on getting information from their app, the first option may be possible.

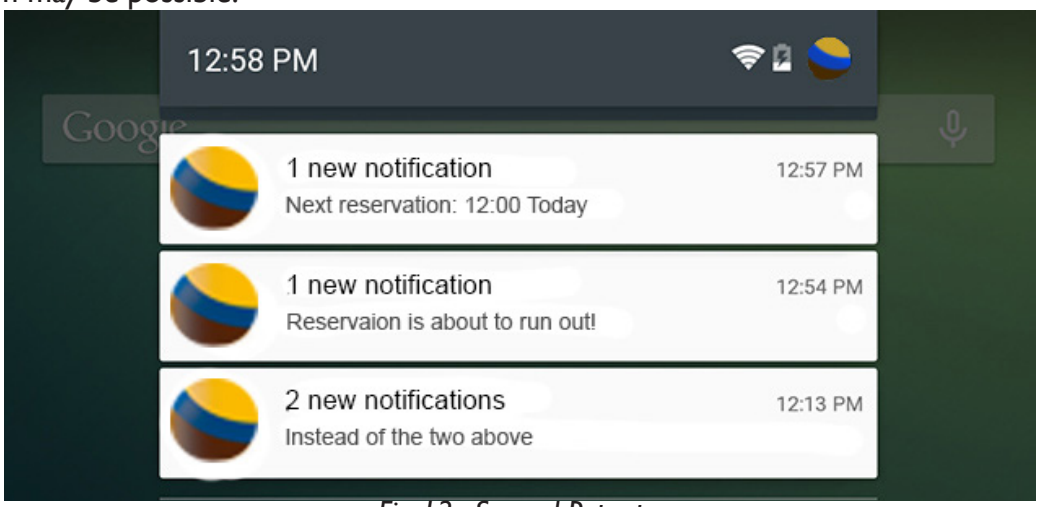


*Fig 12. Several Pop-ups*

# Future Functionality

A lot of future Functionality could be added. When something is arranged with Mercedes, the data of the Smart-vehicles can be read out and used to provide useful information to the customer. This is discussed in an earlier chapter.

Another function that could be implemented is that the cars can get rated on different aspects (like car2go does). This can consider the interior, exterior, comfort and experience. This can be done after finishing a car ride, within a particular period of time. This can be done in the shape of stars, emoticons, giving the car a grade, or a mix of these methods. For now, this function is a little bit over the top, but in the future, if LochemEnergie grows to a larger amount of vehicles, this could be a useful function.

Another great marketing tecnique could be to let current customers put forward new customers to try renting with LochemEnergie for a discount for their next reservation. Experimenting with this may be useful for LochemEnergie to expand its customer pool.

When expanding the business, LochemEnergie might provide a wider variance of vehicles. Different aspects of the car may be distinguished, like number of seats, price, scope, etc. A needed function of the reservation system might include some sort of filter, depending on the amount of vehicles per city. If there are just a few vehicles per city, this might not be necessary.

# 4. Functionality

## Conclusion

The app will be developed in several phases because the app should be used as soon as possible. The problem is that Casemaster Solutions can not provide all of the functionality that soon. The basic functionality, which is mainly everything that is needed for the reservations, is going to be implemented in the first version of the application. More advanced functionality will be inserted in the app in later stages.

There is also chosen to develop this app as a hybrid app, which is a very basic application that is easily built for multiple operating systems like Android or iOS. This hybrid app will link to a web application that will contain the actual system. For reservations, there has been chosen to give the appropriate suggestions of cars that could be rented after giving the following information: City, Location inside of the city and the date and time the user would want to rent a vehicle. The order the reservations are done, and the choices the customer will make depend on what information is more crucial. For the First prototype, there has been chosen to do this in the order of City>Locations in the city>Date and Time>Car. For the Key transfer, lockers will be hanged nearby the charging stations of the vehicles. This way, the customers will not have to bother other people, will be less burdened and might be willing to rent more often.

There is chosen that the payment system will not change for the time being. This will still be done with direct debit. This will be made easier by automatically generating the needed list of reservations by the new system. In the future, more payment options could be added because this might be necessary and worthwhile when LochemEnergie expands. It would have been nice if the app could show the battery status of the rented vehicle and the charging stations where can be charged when the customer is on the road. This is impossible unfortunately, so there has been chosen to let the application link to other services that could provide this function. Also, it is a good idea to display some sort of emergency number that customers can call when something went wrong. Especially with new customers that are inexperienced with electric vehicles, it could happen that the battery runs out. Finally, the app should generate pop-ups when necessary, this will be done as a reminder of the reservation and when the customer is running out of the reserved time.

# 5. First Prototype

## First prototype

After the functions were decided and detailed, a first prototype was created. This prototype is made in Axure RP Pro 7.0, and the functionalities are worked out as good as possible. Because the application will become quite complicated, a lot of data has to be stored and not all of the functionality can be worked out. The styling of the app is not done in the first prototype. In the first prototype only the functionality is worked out. In the final design, the styling will be looked into a bit more.

At the start, the user will see the login screen. The user cannot get to the functionality of the app when he or she is not logged in because the app is exclusively for LochemEnergie members. In the prototype, there could be logged in with the username 'admin' and the password 'admin'. After this, the app will go to the main menu, where the user can see the next reservation if he/she has one and five different buttons: Reserve, Car locations, User, Charging stations and Information.

When pressing the reserve button, the user will see a screen where the city where he/she wants to reserve a car can be chosen. After this, a choice can be made where in the city the car will be picked up. In the case of LochemEnergie there are three choices, but for Almen and Gorssel there is only one. For the latter two, this screen is unnecessary but for the sake of the clearness of the app, this screen will be shown. Next, the date and the time of the reservation can be chosen. When this is done, all of the conditions for the reservation are known and the user can see all the availabilities. The car can be available, semi-available and unavailable. When unavailable, the car will be shown, but cannot be selected. When the car is semi-available, the car can be selected, but the user will get a warning that the car is not fully available for the chosen time. After a car is chosen, the user will have to confirm the reservation by inserting his password. This way, the user can stay logged in with the app, but other people cannot accidentally make a reservation. When the user inserts the password, a message will appear, thanking the user and the app will link the app back to the main menu.

Another functionality which can be chosen from the menu will be the car locations. With this function, the user can see a map with all the locations of the cars. When the pin is green, a car is available at the moment. When the pin is red, there is no car available. This function is not worked out in the prototype unfortunately, but this will work similar to the normal reservation process.

The third function is the user information. In this menu, the personal information can be reviewed and changed. Also a history of the past reservations can be viewed. At least the last few months will be available to see. There functions are not worked out in the prototype.

The next function is the charging stations. As can be read on page 40, the only way the customers can be helped with this is to link them to another party which provides this service.

The last function will be the information. In this submenu, information about charging, the use of the vehicle and the emergency numbers will be found. This will be supported by YouTube videos, which will clearly explain how everything works.

The prototype can be tried out with the following link:
http://portfolio.io.utwente.nl/student/binnenmarsn/prototype


*Fig 13.The first prototype*

# 6. Improving Design

## Feedback

After the prototype was built. The app was sent to several parties: Casemaster solutions, several customers and other people that are engaged in this project. Little feedback was recieved back unfortunately. The feedback that was found was the following:

- there should be an overview of all the reservations.
- It should be possible to change/cancel reservations.
- It should be possible to set reminders for your reservations.

## Usability Test

To further explore the usability of the app, a usability test should be performed. There unfortunately was no change to execute a test like this, but can surely help when improving the app in the future. The prototype that is made from the app should be tested by several customers by asking then to perform several actions. For example:

- Reserve a car in Lochem, at the Koedijk from 12:00 to 18:00 and select the car with the highest scope.
- Cancel the last reservation
- Find the history of your reservations.
- Change your subscription to a flexible 2/month subscription.

More of these actions can be chosen, the important thing is that every function of the app will be treated in order to get feedback on the whole system. The way that the app is used should be observed and possible mistakes or uncertainty should be noted. After testing the prototype, the user should take a survey about the test he just went through. Questions that should be asked must focus on the usability of the app and the understanding of the structure. Could the user easily find the desired function? Was it clear to what menu the user should go to find the desired function? Etc.

Based on the observations and the survey, problems can be identified and solutions to this problems can be found. This will result in a better application what can be tested again. This can be repeated until LochemEnergie is satisfied.

# Youth panel

In the end of the process, there was a conversation with a panel of four 4VWO students that are also doing a project considering the reservation app of LochemEnergie. Ideas from both sides were discussed and the prototype was went through. During this conversation, one big improvement was found in comparison the the first prototype.

**Making the app more accessible for non-members of LochemEnergie.**
As the prototype is designed now, people that are not a member of LochemEnergie cannot use the app, as in the beginning, the user has to log in to the system before he is able to go the main menu. This way, nobody can have a look at the functionality it provides, besides the LochemEnergie website for instance. A solution for this, might be to displace the login process from a submenu of the main menu. This way, external users can have a better overview of the services this app provides and this can convince them to become a member of LochemEnergie.

Another functionality that will displacing the login screen make possible is that Google Maps might now be used, as it is no longer used behind a password. This makes it possible to create a map where the current available cars can be viewed.

# 7. Final Design

## Final Design

After some feedback and conversations, the prototype was improved. The functionality overall stays the same as the first prototype, only some changes are made. I will explain the differences that are made.

Most importantly, the login screen has been moved backwards. When the app is opened, the users will see the main menu, whereupon the customers of LochemEnergie can log in. Other people can still view the app and can see what functions LochemEnergie has to offer. This way the customer can possibly be convinced to become a member of LochemEnergie.

Also, some of the missing functions in the first prototype are added. This way the full functionality of the app can be tried. A new button in the main menu is added which links to the current reservations as well as the past ones, this way, the history is moved from the user submenu to the reservations menu. The past reservations will be shown in a grey bar, to indicate that it has past.

Also, the styling of the app has been altered. The same style has been given to all of the submenus to form a whole. This has been done with the colors of LochemEnergie.

The prototype can be tried out with the following link:
http://portfolio.io.utwente.nl/student/binnenmarsn/prototype2


*Fig 14.The final design*

# 8. Recommendations, Conclusion and Discussion

## Reccomendations

Certain Recommendations can be made for LochemEnergie:

- Organize a test group

When the first version of the application is built, arrange a group of customers to function as a test panel. Let them test the app for a (few) month(s) before releasing it to the rest of the customers. This way, important feedback can be gained which can be used to improve the application and the last bugs can be filtered out. This is an extension of the usability test, where with the usability test, the design can further be improved and this is more to make sure that the app works properly.

- Making use of pretotyping

What can be done before releasing the app is to make sure that the customers really need an application like this. This can be done by making use of pretotyping. Pretotyping is something else as prototyping, as it actually should be done before releasing or developing a new service. It makes use of a very basic model of the desired system, which can be built in a few minutes. For this app for example, a very basic model of application can be made out of a piece of wood and/or paper. Someone, preferably a user of the future system, can then pretend to use the new application. By doing this, not the actual functionality of the app is tested, but the need of the application to be developed. If the result is that the user doesn't use the prototype, questions should be asked if the app is really needed.

"Make sure you are building the right 'it' before building 'it' right" – Alberto Savoia.

- Bringing the organization of EV-rental to a new company/organization

LochemEnergie is much more than just EV-rental. With the desire to grow this business to a large amount of vehicles, this could cause EV-rental to overshadow the rest of the activities LochemEnergie is involved with. There can be imagined that LochemEnergie does not want to be considered as just an EV-rental company, but as the cooperative association which focusses on the subject of sustainable energy as it is. Another advantage of this is that only the customers of LochemEnergie that have interest in the EV-rental will be involved with EV-rental. The other customers of LochemEnergie will eventually be able to get acces through LochemEnergie.

# Conclusions/Discussion

Now the assignment has been completed, there can be looked back. It was a very challenging assignment. As app design and electric driving were both quite a new experience. Only two subjects of the Bachelor relate to this, design of interactive products and website-design. With the knowledge of this, plus making use of the frameworks that were discussed at the start, this assignment has been done.

It was challenging as the project is just started and there was nothing to start with. To fully understand the problems, a lot of parties had to be talked with, people from LochemEnergie, Casemaster Solutions, Can Okur, customers, the family that manages the reservation process, and several more. Also the frameworks were challenging, because it requires some activities with customers. This can be challenging when working in Enschede and the customers are in Lochem. Eventually, this all went well and a lot of information is gathered. During the different conversations, a lot of the requirements, wishes, possibilities and limitations changed, which resulted in a very rapidly changing program of requirements.

The phase of identifying the different functionality, which changed a lot over time, besides the time that had to be waited on customer's replies, caused the design phase to move backward. Therefore, a lot of the functionality has been thought through, but unfortunately is not yet implemented in a final design. The design as it is now, can still be improved a lot with testing the prototype and recieving feedback from customers. The foundation of the app is there though, so LochemEnergie in Cooperation can build forward on the result. This has to be done by making use of usability tests and feedback from customers.

Looking back on the research questions, the requirements of the system are defined and worked out. The survey and the interviews provided a lot of feedback on the current situation and the improvements that could be done. Especially the availability of the vehicles should be displayed clearly. Also the lockers for the car keys are important as customers do not like to bother other people to recieve this key. A good overview of the costs and the possibility to check the previous reservations of that month is most important. The most important feature is the possibility to let the customers know when the cars are available as soon as possible.
The last research question was how the layout of the app would look like. This question has partly been answered. The functionality of the reservation system has been worked out, but it is not pinned down yet. This would have been done in collaboration with customers, but this unfortunately didn't work out as expected. A first prototype has been made though, but this will have to be improved in the future.

Questions could be asked about the outcome of the interview, as there were only three people interviewed. This is not a lot and real conclusions should not be drawn of the opinion of three people. In the context of this assignment there was unfortunately no other possibility to assume the result of the interviews reflect the opinion of the users.

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6. Fig. 8: http://www.andrewthompson.co/2013/09/examples-of-mobile-first-development.html

7. Fig 9: tidewatertravel.com

8. Fig 11: http://www.plugincars.com/quick-guide-buying-your-first-home-ev-charger-126875.html

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| Statistic | Value |
|---|---|
| Total Responses | 50 |

### 6. Aantal keren dat ik een elektrische deelauto van LochemEnergie heb gehuurd:

| # | Answer | | Response | % |
|---|---|---|---|---|
| 1 | 0x | | 32 | 50% |
| 2 | 1-5x | | 18 | 28% |
| 3 | 6-15x | | 10 | 16% |
| 4 | 16-en meer | | 4 | 6% |
| | Total | | 64 | 100% |

| Statistic | Value |
|---|---|
| Min Value | 1 |
| Max Value | 4 |
| Mean | 1.78 |
| Variance | 0.87 |
| Standard Deviation | 0.93 |
| Total Responses | 64 |

### 7. Heb jij nu een eigen auto ter beschikking?

| # | Answer | | Response | % |
|---|---|---|---|---|
| 1 | ja | | 58 | 89% |
| 2 | nee | | 5 | 8% |
| 3 | tsja | | 2 | 3% |
| | Total | | 65 | 100% |

| Statistic | Value |
|---|---|
| Min Value | 1 |
| Max Value | 3 |
| Mean | 1.14 |
| Variance | 0.18 |
| Standard Deviation | 0.43 |
| Total Responses | 65 |

### 8. Is er in jouw huishouding een 2e auto waar je gebruik van zou kunnen maken?

| # | Answer | | Response | % |
|---|---|---|---|---|
| 1 | ja | | 23 | 35% |
| 2 | nee | | 41 | 63% |
| 3 | tsja | | 1 | 2% |
| | Total | | 65 | 100% |

| Statistic | Value |
|---|---|
| Min Value | 1 |
| Max Value | 3 |
| Mean | 1.66 |
| Variance | 0.26 |
| Standard Deviation | 0.51 |
| Total Responses | 65 |

### 9. Zo ja, gebruik je de 2e auto met enige regelmaat?

| # | Answer | | Response | % |
|---|---|---|---|---|
| 1 | ja | | 18 | 51% |
| 2 | nee | | 14 | 40% |
| 3 | tsja | | 3 | 9% |
| | Total | | 35 | 100% |

| Statistic | Value |
|---|---|
| Min Value | 1 |
| Max Value | 3 |
| Mean | 1.57 |
| Variance | 0.43 |
| Standard Deviation | 0.65 |
| Total Responses | 35 |

### 10. Zou jouw deelname aan het deelauto-project de 2e auto overbodig maken?

| # | Answer | | Response | % |
|---|---|---|---|---|
| 1 | ja | | 21 | 47% |
| 2 | nee | | 17 | 38% |
| 3 | tsja | | 7 | 16% |
| | Total | | 45 | 100% |

| Statistic | Value |
|---|---|
| Min Value | 1 |
| Max Value | 3 |
| Mean | 1.69 |
| Variance | 0.54 |
| Standard Deviation | 0.73 |
| Total Responses | 45 |

### 11. Ik ben een ervaren elektrische deelauto rijder (minstens 3 maanden ervaring).

| # | Answer | | Response | % |
|---|---|---|---|---|
| 1 | ja | | 16 | 25% |
| 2 | nee | | 46 | 72% |
| 3 | tsja | | 2 | 3% |
| | Total | | 64 | 100% |

| Statistic | Value |
|---|---|
| Min Value | 1 |
| Max Value | 3 |
| Mean | 1.78 |
| Variance | 0.24 |
| Standard Deviation | 0.49 |
| Total Responses | 64 |

## 12. Ik ben zeer tevreden over het delen van de smarts in Lochem.

| # | Answer | | Response | % |
|---|---|---|---|---|
| 1 | ja | | 37 | 65% |
| 2 | nee | | 0 | 0% |
| 3 | tsja | | 20 | 35% |
| | Total | | 57 | 100% |

| Statistic | Value |
|---|---|
| Min Value | 1 |
| Max Value | 3 |
| Mean | 1.70 |
| Variance | 0.93 |
| Standard Deviation | 0.96 |
| Total Responses | 57 |

## 13. Het huren van een deelauto is altijd goedkoper als een eigenauto die je weinig gebruikt.

| # | Answer | | Response | % |
|---|---|---|---|---|
| 1 | ja | | 49 | 78% |
| 2 | nee | | 2 | 3% |
| 3 | tsja | | 12 | 19% |
| | Total | | 63 | 100% |

| Statistic | Value |
|---|---|
| Min Value | 1 |
| Max Value | 3 |
| Mean | 1.41 |
| Variance | 0.63 |
| Standard Deviation | 0.80 |
| Total Responses | 63 |

## 14. Rijden in een elektrische deelauto vind ik leuk.

| # | Answer | | Response | % |
|---|---|---|---|---|
| 1 | Helemaal mee eens | | 25 | 40% |
| 2 | Mee eens | | 16 | 25% |
| 3 | Niet mee eens / oneens | | 21 | 33% |
| 4 | Mee oneens | | 1 | 2% |
| 5 | Helemaal mee oneens | | 0 | 0% |
| | Total | | 63 | 100% |

| Statistic | Value |
|---|---|
| Min Value | 1 |
| Max Value | 4 |
| Mean | 1.97 |
| Variance | 0.81 |
| Standard Deviation | 0.90 |
| Total Responses | 63 |

## 15. Elektrische voertuigen zijn de transportmiddelen van de toekomst.

| # | Answer | | Response | % |
|---|---|---|---|---|
| 1 | Helemaal mee eens | | 19 | 30% |
| 2 | Mee eens | | 31 | 49% |
| 3 | Niet mee eens / oneens | | 12 | 19% |
| 4 | Mee oneens | | 1 | 2% |
| 5 | Helemaal mee oneens | | 0 | 0% |
| | Total | | 63 | 100% |

| Statistic | Value |
|---|---|
| Min Value | 1 |
| Max Value | 4 |
| Mean | 1.92 |
| Variance | 0.56 |
| Standard Deviation | 0.75 |
| Total Responses | 63 |

Appendix A

## 16. Elektrische voertuigen zijn een oplossing voor het verminderen van de luchtvervuiling.

| # | Answer | | Response | % |
|---|---|---|---|---|
| 1 | Helemaal mee eens | | 26 | 41% |
| 2 | Mee eens | | 32 | 51% |
| 3 | Niet mee eens / oneens | | 5 | 8% |
| 4 | Mee oneens | | 0 | 0% |
| 5 | Helemaal mee oneens | | 0 | 0% |
| | Total | | 63 | 100% |

| Statistic | Value |
|---|---|
| Min Value | 1 |
| Max Value | 3 |
| Mean | 1.67 |
| Variance | 0.39 |
| Standard Deviation | 0.62 |
| Total Responses | 63 |

## 17. Ik ben overtuigd van het nut van de elektrische deelauto.

| # | Answer | | Response | % |
|---|---|---|---|---|
| 1 | Helemaal mee eens | | 29 | 46% |
| 2 | Mee eens | | 28 | 44% |
| 3 | Niet mee eens / oneens | | 6 | 10% |
| 4 | Mee oneens | | 0 | 0% |
| 5 | Helemaal mee oneens | | 0 | 0% |
| | Total | | 63 | 100% |

| Statistic | Value |
|---|---|
| Min Value | 1 |
| Max Value | 3 |
| Mean | 1.63 |
| Variance | 0.43 |
| Standard Deviation | 0.66 |
| Total Responses | 63 |

## 18. Elektrische voertuigen moeten een grotere rol spelen in ons mobiliteitssysteem.

| # | Answer | | Response | % |
|---|---|---|---|---|
| 1 | Helemaal mee eens | | 33 | 52% |
| 2 | Mee eens | | 27 | 43% |
| 3 | Niet mee eens / oneens | | 3 | 5% |
| 4 | Mee oneens | | 0 | 0% |
| 5 | Helemaal mee oneens | | 0 | 0% |
| | Total | | 63 | 100% |

| Statistic | Value |
|---|---|
| Min Value | 1 |
| Max Value | 3 |
| Mean | 1.52 |
| Variance | 0.35 |
| Standard Deviation | 0.59 |
| Total Responses | 63 |

## 19. Ik denk dat een/meerdere elektrische auto(´s) als einige vorm van vervoersmiddel voldoende zullen zijn voor een huishouden.

| # | Answer | | Response | % |
|---|---|---|---|---|
| 1 | Helemaal mee eens | | 11 | 17% |
| 2 | Mee eens | | 17 | 27% |
| 3 | Niet mee eens / oneens | | 21 | 33% |
| 4 | Mee oneens | | 11 | 17% |
| 5 | Helemaal mee oneens | | 3 | 5% |
| | Total | | 63 | 100% |

| Statistic | Value |
|---|---|
| Min Value | 1 |
| Max Value | 5 |
| Mean | 2.65 |
| Variance | 1.23 |
| Standard Deviation | 1.11 |
| Total Responses | 63 |

## 20. Elektrische voertuigen zijn geschikt voor dagelijks gebruik.

| # | Answer | | Response | % |
|---|---|---|---|---|
| 1 | Helemaal mee eens | | 23 | 37% |
| 2 | Mee eens | | 26 | 41% |
| 3 | Niet mee eens / oneens | | 13 | 21% |
| 4 | Mee oneens | | 1 | 2% |
| 5 | Helemaal mee oneens | | 0 | 0% |
| | Total | | 63 | 100% |

| Statistic | Value |
|---|---|
| Min Value | 1 |
| Max Value | 4 |
| Mean | 1.87 |
| Variance | 0.63 |
| Standard Deviation | 0.79 |
| Total Responses | 63 |

## 21. Ik wil graag doorstarten met huren van deelauto's.

| # | Answer | | Response | % |
|---|---|---|---|---|
| 1 | ja | | 34 | 57% |
| 2 | nee | | 2 | 3% |
| 3 | tsja | | 24 | 40% |
| | Total | | 60 | 100% |

| Statistic | Value |
|---|---|
| Min Value | 1 |
| Max Value | 3 |
| Mean | 1.83 |
| Variance | 0.95 |
| Standard Deviation | 0.98 |
| Total Responses | 60 |

## 22. Ik ben bereid een rol te spelen in de organisatie van de elektrische deelauto in mijn straat/wijk.

| # | Answer | | Response | % |
|---|---|---|---|---|
| 1 | ja | | 15 | 24% |
| 2 | nee | | 32 | 52% |
| 3 | tsja | | 15 | 24% |
| | Total | | 62 | 100% |

| Statistic | Value |
|---|---|
| Min Value | 1 |
| Max Value | 3 |
| Mean | 2.00 |
| Variance | 0.49 |
| Standard Deviation | 0.70 |
| Total Responses | 62 |

## 23. Een deelauto kan bij mij op de oprit staan en laadvoorziening kan worden geïnstalleerd.

| # | Answer | | Response | % |
|---|---|---|---|---|
| 1 | ja | | 11 | 17% |
| 2 | nee | | 40 | 63% |
| 3 | tsja | | 12 | 19% |
| | Total | | 63 | 100% |

| Statistic | Value |
|---|---|
| Min Value | 1 |
| Max Value | 3 |
| Mean | 2.02 |
| Variance | 0.37 |
| Standard Deviation | 0.61 |
| Total Responses | 63 |

## 24. Ik zou graag met een groep van 5-10 personen in de straat/wijk een elektrische auto delen.

| # | Answer | | Response | % |
|---|---|---|---|---|
| 1 | ja | | 13 | 22% |
| 2 | nee | | 17 | 28% |
| 3 | tsja | | 30 | 50% |
| | Total | | 60 | 100% |

| Statistic | Value |
|---|---|
| Min Value | 1 |
| Max Value | 3 |
| Mean | 2.28 |
| Variance | 0.65 |
| Standard Deviation | 0.80 |
| Total Responses | 60 |

## 25. Ik zou graag met een groep van 10-20 personen in de wijk een elektrische auto delen.

| # | Answer | | Response | % |
|---|---|---|---|---|
| 1 | ja | | 13 | 23% |
| 2 | nee | | 18 | 32% |
| 3 | tsja | | 26 | 46% |
| | Total | | 57 | 100% |

| Statistic | Value |
|---|---|
| Min Value | 1 |
| Max Value | 3 |
| Mean | 2.23 |
| Variance | 0.64 |
| Standard Deviation | 0.80 |
| Total Responses | 57 |

### 26. Ik zou graag met alle leden van LochemEnergie een deelauto delen.

| # | Answer | | Response | % |
|---|---|---|---|---|
| 1 | ja | | 27 | 44% |
| 2 | nee | | 9 | 15% |
| 3 | tsja | | 25 | 41% |
| | Total | | 61 | 100% |

| Statistic | Value |
|---|---|
| Min Value | 1 |
| Max Value | 3 |
| Mean | 1.97 |
| Variance | 0.87 |
| Standard Deviation | 0.93 |
| Total Responses | 61 |

### 27. Ik wil 1 a 2x per maand een deelauto huren zonder vaste dagen of dagdelen.

| # | Answer | | Response | % |
|---|---|---|---|---|
| 1 | ja | | 21 | 36% |
| 2 | nee | | 23 | 40% |
| 3 | tsja | | 14 | 24% |
| | Total | | 58 | 100% |

| Statistic | Value |
|---|---|
| Min Value | 1 |
| Max Value | 3 |
| Mean | 1.88 |
| Variance | 0.60 |
| Standard Deviation | 0.77 |
| Total Responses | 58 |

### 28. Ik wil 4 a 6x per maand een deelauto huren zonder vaste dagen of dagdelen.

| # | Answer | | Response | % |
|---|---|---|---|---|
| 1 | ja | | 12 | 22% |
| 2 | nee | | 26 | 48% |
| 3 | tsja | | 16 | 30% |
| | Total | | 54 | 100% |

| Statistic | Value |
|---|---|
| Min Value | 1 |
| Max Value | 3 |
| Mean | 2.07 |
| Variance | 0.52 |
| Standard Deviation | 0.72 |
| Total Responses | 54 |

### 29. Ik wil in het weekend huren tegen speciaal lage prijs.

| # | Answer | | Response | % |
|---|---|---|---|---|
| 1 | ja | | 17 | 29% |
| 2 | nee | | 27 | 47% |
| 3 | tsja | | 14 | 24% |
| | Total | | 58 | 100% |

| Statistic | Value |
|---|---|
| Min Value | 1 |
| Max Value | 3 |
| Mean | 1.95 |
| Variance | 0.54 |
| Standard Deviation | 0.74 |
| Total Responses | 58 |

### 30. Ik heb een deelauto nodig op 1 of 2 vaste dagdelen per week (of 1 hele dag).

| # | Answer | | Response | % |
|---|---|---|---|---|
| 1 | ja | | 9 | 15% |
| 2 | nee | | 42 | 71% |
| 3 | tsja | | 8 | 14% |
| | Total | | 59 | 100% |

| Statistic | Value |
|---|---|
| Min Value | 1 |
| Max Value | 3 |
| Mean | 1.98 |
| Variance | 0.29 |
| Standard Deviation | 0.54 |
| Total Responses | 59 |

### 31. Ik heb een deelauto nodig op 3 vaste dagdelen (of anderhalve dag).

| # | Answer | | Response | % |
|---|---|---|---|---|
| 1 | ja | | 4 | 7% |
| 2 | nee | | 46 | 79% |
| 3 | tsja | | 8 | 14% |
| | Total | | 58 | 100% |

| Statistic | Value |
|---|---|
| Min Value | 1 |
| Max Value | 3 |
| Mean | 2.07 |
| Variance | 0.21 |
| Standard Deviation | 0.45 |
| Total Responses | 58 |

## 32. Ik heb een deelauto nodig op 4 of meer vaste dagdelen (of twee hele dagen).

| # | Answer | | Response | % |
|---|---|---|---|---|
| 1 | ja | | 4 | 7% |
| 2 | nee | | 50 | 85% |
| 3 | tsja | | 5 | 8% |
| | Total | | 59 | 100% |

| Statistic | Value |
|---|---|
| Min Value | 1 |
| Max Value | 3 |
| Mean | 2.02 |
| Variance | 0.15 |
| Standard Deviation | 0.39 |
| Total Responses | 59 |

## 33. Mijn vaste dagdelen dat ik een deelauto huur zouden zijn (aankruisen):

| # | Question | Ochtend | Middag | Avond | Total Responses |
|---|---|---|---|---|---|
| 1 | Maandag | 5 | 3 | 3 | 11 |
| 2 | Dinsdag | 4 | 3 | 2 | 9 |
| 3 | Woensdag | 4 | 3 | 2 | 9 |
| 4 | Donderdag | 4 | 3 | 2 | 9 |
| 5 | Vrijdag | 6 | 4 | 1 | 11 |
| 6 | Zaterdag | 2 | 0 | 0 | 2 |
| 7 | Zondag | 0 | 0 | 0 | 0 |

| Statistic | Maandag | Dinsdag | Woensdag | Donderdag | Vrijdag | Zaterdag | Zondag |
|---|---|---|---|---|---|---|---|
| Min Value | 2 | 2 | 2 | 2 | 2 | 2 | - |
| Max Value | 4 | 4 | 4 | 4 | 4 | 2 | - |
| Total Responses | 8 | 5 | 6 | 7 | 6 | 2 | 0 |

## 34. Gewenste informatie voor adequaat reserveren:

| # | Question | Ja | Tsja | Nee | Total Responses | Mean |
|---|---|---|---|---|---|---|
| 1 | Reserveren via internet | 52 | 2 | 0 | 54 | 1.04 |
| 2 | Opgeven hoeveel km rijden | 36 | 14 | 3 | 53 | 1.38 |
| 3 | Opgeven of je onderweg gaat laden | 30 | 19 | 4 | 53 | 1.51 |
| 4 | Beschikbaarheid auto te zien bij reserveren | 52 | 1 | 1 | 54 | 1.06 |
| 5 | Informatie hoe sleuteloverdracht (code sleutelkastje) | 49 | 3 | 2 | 54 | 1.13 |
| 6 | Informatie accustatus | 49 | 2 | 2 | 53 | 1.11 |

| Statistic | Reserveren via internet | Opgeven hoeveel km rijden | Opgeven of je onderweg gaat laden | Beschikbaarheid auto te zien bij reserveren | Informatie hoe sleuteloverdracht (code sleutelkastje) | Informatie accustatus |
|---|---|---|---|---|---|---|
| Min Value | 1 | 1 | 1 | 1 | 1 | 1 |
| Max Value | 2 | 3 | 3 | 3 | 3 | 3 |
| Mean | 1.04 | 1.38 | 1.51 | 1.06 | 1.13 | 1.11 |
| Variance | 0.04 | 0.35 | 0.41 | 0.09 | 0.19 | 0.18 |
| Standard Deviation | 0.19 | 0.60 | 0.64 | 0.30 | 0.44 | 0.42 |
| Total Responses | 54 | 53 | 53 | 54 | 54 | 53 |

Appendix A

## 35. Waar zou u graag meer over worden geïnformeerd?

| Text Response |
|---|
| Beschikbaarheid per direct |
| Over een online tool zodat je realtime kunt zien welke auto's beschikbaar zijn, welke er te huur zijn en wanneer welke auto (naar verwachting) terugkomt. |
| kilometer mogelijkheid |
| bovenstaande vraag allen beantwoorden met ja ( tablet pakt antwoord niet) |
| prijs |
| indien niet beschikbaar, wanneer dan wel? |
| prolongatie project |
| info wanneer auto beschikbaar is. |
| zou niet weten... |
| innovatie/verbetertraject |
| is er een mogelijkheid een auto te huren die ik kan gebruiken om bv naar mijn kinderen (in Emmen en Groningen) te rijden? |
| prettig om aangehaakt te blijven, wij hebben als gezin nu 1 auto, toen onze auto een poosje kapot was auto gehuurd via snapcar en 1 keer electrisch via lochem energie, beviel goed, kan me voorstellen dat we hem af en toe als 2e auto huren als het makkelijk gaat |
| laadtoerstand bij terugkeer |
| Flexibiliteit in terugbrengtijd |
| de kosten |
| Prijs |

| Statistic | Value |
|---|---|
| Total Responses | 16 |

## 36. Vul uw eigen bereidheid tot betalen in voor de waarde van het product:

Default - Af en toe huren voor een dagdeel (1-4 uur) : Prijs 12 €

| Uw prijs: |
|---|
| 10 |
| 5 |
| 10 |
| 12 |
| 12 |
| 7,50 |
| 8 |
| 12 |
| 10 |
| 10 |
| 10 |
| 12 |
| 12 |
| 5 |
| 12 |
| 12 |
| 7,50 |
| 7,50 |
| 10 |
| 10 |
| 10 |
| 10 |
| 10 |
| 10 |
| 10 |
| 12 |
| 12 |
| 10 |
| 9 |
| 10 |
| 7.50 |
| 10 |
| 10 |

Default - Af en toe huren voor twee dagdelen (5-8 uur): Prijs 20 €

| Uw prijs: |
|---|
| 20 |
| 20 |
| 20 |
| 10 |
| 15 |
| 20 |
| 15 |
| 15 |
| 20 |
| 20 |
| 10 |
| 20 |
| 20 |
| 15.00 |
| 10 a 20 |
| 20 |
| 20 |
| 20 |
| 15 |
| 20 |
| 20 |
| 15 |
| 15 |
| 15 |
| 15,- |
| 18 |
| 20 |

Default - Af en toe huren voor een hele dag (9-12 uur): Prijs 25 €

Appendix A

| Uw prijs: |
|---|
| 20 |
| 25 |
| 25 |
| 15 |
| 15 |
| ja |
| 15 |
| 20 |
| 20 |
| 25 |
| 25 |
| 15 |
| 20 |
| 25 |
| 17,50 |
| 20 a 30 |
| 25 |
| 25 |
| 25 |
| 20 |
| 25 |
| 25 |
| 20 |
| 18 |
| 25 |
| 15 |
| 25 |

Default - Vast dagdeel abonnement (4x per maand): Prijs 60 €

| Uw prijs: |
|---|
| 35 |
| 50 |
| 60 |
| 30 |
| 30 |
| 50 |
| 45 |
| 25 |
| nvt |
| 50,00 |
| 50 |
| 35 |
| 60 |
| 50 |
| 40 |
| 60 |
| 40 |
| 50 |

Default - Vaste dag abonnement per (4x per maand): Prijs 80 €

| Uw prijs: |
|---|
| 60 |
| 80 |
| 40 |
| 55 |
| 70 |
| 50 |
| 50 |
| nvt |
| 65,00 |
| 75 |
| 75 |
| 80 |
| 70 |
| 60 |
| 70 |
| 80 |
| 60 |
| 75 |

Default - Vaste dag (9-12 uur): Prijs 100 €

| Uw prijs: |
|---|
| 80 |
| 25 |
| 50 |
| ? |
| 90 |
| 75 |
| 1520 |
| nvt |
| ? |
| 75 |
| 95 |
| 100 |
| 80 |
| 85 |
| 100 |
| 80 |
| 50 |

Default - Flexibel abonnement 4x dagdeel: Prijs 40 €

| Uw prijs: |
|---|
| 35 |
| 40 |
| 40 |
| 40 |
| 20 |
| 30 |
| 35 |
| 40 |
| 40 |
| 35 |
| 30 |
| 30,00 |
| 40 |
| 40 |
| 40 |
| 30 |
| 40 |
| 30 |
| 40 |
| 40 |

Default - Flexibel abonnement 4x dag: Prijs 60 €

| Uw prijs: |
|---|
| 60 |
| 60 |
| 60 |
| 60 |
| 30 |
| ja |
| 50 |
| 55 |
| 45 |
| 50 |
| 60 |
| 60 |
| 50,00 |
| 50 |
| 75 |
| 60 |
| 50 |
| 60 |
| 60 |
| 50 |
| 60 |
| 50 |

| Statistic | Af en toe huren voor een dagdeel (1-4 uur): Prijs 12 € | Af en toe huren voor twee dagdelen (5-8 uur): Prijs 20 € | Af en toe huren voor een hele dag (9-12 uur): Prijs 25 € | Vast dagdeel abonnement (4x per maand): Prijs 60 € | Vaste dag abonnement per (4x per maand): Prijs 80 € | Vaste dag (9-12 uur): Prijs 100 € | Flexibel abonnement 4x dagdeel: Prijs 40 € | Flexibel abonnement 4x dag: Prijs 60 € |
|---|---|---|---|---|---|---|---|---|
| Min Value | - | - | - | - | - | - | - | - |
| Max Value | - | - | - | - | - | - | - | - |
| Total Responses | - | - | - | - | - | - | - | - |

## 37. Vind je bovengenoemde prijzen over het algemeen realistisch?

| # | Answer | | Response | % |
|---|---|---|---|---|
| 1 | ja | | 28 | 51% |
| 2 | nee | | 6 | 11% |
| 3 | tsja | | 21 | 38% |
| | Total | | 55 | 100% |

| Statistic | Value |
|---|---|
| Min Value | 1 |
| Max Value | 3 |
| Mean | 1.87 |
| Variance | 0.89 |
| Standard Deviation | 0.94 |
| Total Responses | 55 |

## 38. Vind je bovengenoemde prijzen goed?

| # | Answer | | Response | % |
|---|---|---|---|---|
| 1 | ja | | 16 | 29% |
| 2 | nee (te goedkoop) | | 0 | 0% |
| 3 | tsja | | 25 | 45% |
| 4 | nee (te duur) | | 14 | 25% |
| | Total | | 55 | 100% |

# Appendix B: Interviews

## User 1

**Interview experienced users**
During this interview there will focus on the rental of electrical vehicles in four phases: the reservation, the picking up, the driving and the return of the car. Three experienced users have been interviewed and there answers can be found below.

**General**
- *How often do you rent a car at LochemEnergie?*

I rent a car approximately two times a month.

- *How do you experience the complete rental procedure?*

I think that the website works quick. But there are a lot of questions, even though the logic in the questions is good. Even as a returning customer I have to fill in a lot of questions. I think that it is possible to make this quicker. The confirmation of the availability of the car takes long. I would like to know immediately after reserving if the car is available or not. The email you get back from LochemEngergie is very unclear. In the email you can find the day of request but not the day on which you want to rent the car. The whole reservation process takes a long time, but that is why you are doing this.

**Reservation**
- *Is there, if you look at the service, something you miss during reservation of a car at LochemEnergie?*

The mail that you get after reserving is very unclear. A while ago I reserved cars for different dates at once. In the return email I had to puzzle to see at what moment the cars were available and at what moments they were not.

**Picking up**
- *What do you think of the current procedure of picking up the car?*

The first time I rented a car it was very unclear to me how to unplug the car form it's loading place. There was suggested that you needed to do a couple of steps in a right order. But in my opinion this was not necessary. Other customers should get more information about this. Because I could not do this it also made me insecure.

- *Is there something that bothers you during the picking up of the car?*

The keybox does not work perfectly. The buttons work inconvenient. You have to fill in a code when you open the the box and also when you close it again. The code that you have to fill in has to be remembered and sometimes I forgot this. You have to leave your bike at the private terrain of somebody you might not know. I don not feel really comfortable with this. I prefer the renting from the Heuvelenweg because the picking up of the car at the Heuvelenweg is more flexible compared to the Koedijk. At the Koedijk there is a family that waits for you to come back. At the Heuvelenweg it does not matter when you pick up the car and when you return it.
Driving

- *What is your opinion about the current situation of driving a rental car from LochemEnergie?*

Driving in the electrical vehicles is very easy, but I do miss my cruise control. I did not use the cars for adventures so for me it was always clear where I was going. So I knew if there would be a charging station at my destination or not. Most of the times it was not necessary to charge the car.

**Return**

- *What do you think of the current procedure of returning a car?*

The Heuvelenweg is the most convenient because you do not have to bother anybody. At this location you have to think of the button on the charging plug. If you do not press this button the car will not be charged. The ramp is quite small, but that is not a big problem. For me it might be easier if the car would stand on a parking lot on the side of the road.

**Application**

- *About what would you like to be informed better during the whole process of renting a car?*

It would be nice if you can see directly if there is a car in the neighborhood available and if you can rent it immediately. Maybe this is an option after you logged in.

- *Do you think that a mobile application would have an added value if you compare it to the reservation on the website?*

Definitely! The site works fine, but you have to do a lot of things. There has to be a better way for this.

- *What would you prefer? A website or an application for your mobile phone?*

I prefer a mobile application.

# Appendix B

## User 2

**General**

- *How often do you rent a car at LochemEnergie?*

I regurlary rent a car from LochemEnergie. Sometimes I rent three cars in a week and sometimes I rent one car in three weeks. It differs a lot when I need a car.

- *How do you experience the complete rental procedure?*

It works fine, and it is nice that it is really close. Sadly enough it is not possible to see if the car is available immediately.

- *What is the main reason why you do not rent a car at LochemEnergie more often?/Could there change anything that would make you rent a car at LochemEnergie more often?*

Not necessary

**Reservation**

- *What is your opinion on the current reservation and paying possibilities?*

This works oke. The direct debit is after you used the car, I really like this. I miss the option to rent a car for only a part of the day instead of for a whole day.

- *Is there, if you look at the service, something you miss during the reservation of a car at LochemEnergie?*

It would be really nice if you could see the availability of the cars immediately online. Furthermore I would like to be able to rent a car for a shorter period. Maybe it is an option to rent the cars per hour or per part of the day.

- *Is there, if you look at the service, something that should be improved during the reservation of a car at LochemEnergie?*

It would be nice if data about me could be remembered. This will make reserving a car at LochemEnergie a lot easier and quicker.

**Picking up**

- *What do you think of the current procedure of picking up the car?*

The key boxes are a nice improvement. Now I do not have to bother people anymore by picking up the keys of the cars. At the Koedijk the key box is not used, but I never go there to pick up a car.

- *Is there something that bothers you during the picking up of the car?*

No, actually not.

- *About what would you like to be informed better for the picking up of the car?*

The first time when you rent a car it is a bit difficult to find out how everything works. After that it is quite easy.

**Driving**

- *What is your opinion about the current situation of driving a rental car from LochemEnergie?*

Fine, I did not have any problems.

**Return**

- *What do you think of the current procedure of returning a car?*

You have to park the car, get your stuff and connect the car to the charging system. This is al really clear.

**Application**

- *About what would you like to be informed better during the whole process of renting a car?*

I would like to be able to see the battery status of the car. And off course I would like to see the availability of the cars immediately. It would also be nice if I could see the availability at the other locations. Maybe it is a good idea to make a difference between cars for four people and cars for two people. Furthermore it would be nice if I could get a reminder if the car gets available when I tried to rent it. Then I can choose to rent it last minute.

- *What information would you like to see in a mobile application?*

I would like to be able to go as quick as possible to the reservation options. It would also be nice if I could see an overview of the costs.

- *What would you prefer? A website or an application for your mobile phone?*

I think that a mobile application would be very useful. Is can easily save my data. It is also very nice that do not have to turn my computer on for renting a car. Everybody has a phone nowadays!

- *Do you have any other comments?*

Further possibilities are to implement subscriptions, You may take a subscription for four day parts for example and if you do not use one of them, the last reservation will be transferred to the next month. You should also be allowed to change your subscription in the app.

**General**

# Appendix B

## User 3

- *How often do you  rent a car at LochemEnergie?*

This varies between two and three times per month.

- *How do you experience the complete rental procedure?*

I really like that there is a possibility to rent an electric vehicle with LochemEnergie, but can be executed much more effective, for example by making use of an application. Then you should be able to immediately see the availability of the cars and you will not have to bother people. For me, it is quite a burden to bother these people every time. This situation should be improved in the future.

- *What is the main reason why you do not rent a car at LochemEnergie more often?/Could there change anything that would make you rent a car at LochemEnergie more often?*

We have a car of our own, but also because the reservation process is a bit laborious. The system as it is now, does not work properly yet, mostly because you will get the confirmation of the reservation only after a day.

**Reservation**

- *What is your opinion on the current reservation and paying possibilities?*

I think I already explained this in an earlier question. It is nice, but not effective.

- *Is there, if you look at the service, something you miss during reservation of a car at LochemEnergie?*

Yes, especially the availability of the cars should be visible more easily. The payments are not very convenient as well, as people make mistakes and we do not get some sort of overview of the past reservations. It would be nice if an overview of the past reservations can be seen for every month. A whole history is not necessary though. And the family that arranges all the reservations should be replaces, so they won't have to be bothered in the future.

**Picking up**

- *What do you think of the current procedure of picking up the car?*

This is really great for us, as it can be done in our own street. It is very easy if you know how it works. If you are not technical, this can be a problem in the beginning though. After this is explained once, this is not a problem

- *What are the improvement you see with picking up the car?*

More points throughout the city would be nice, there are just three spots in the city where this can be done, and it could be nice for other customers if there were some more spots, for example at the train station. People can go there with the bus. For me it would be an obstruction if the car would be far away from my own home.

**Driving**

- *What is your opinion about the current situation of driving a rental car from LochemEnergie?*

The car differ from each other. The newer cars are nicer than the older ones and there is a significant difference. With reserving, there cannot be chosen between the several vehicles. It is a surprise what car you will get and the prices are the same. This is not right and there should be a difference in pricing.

**Return**

- *What do you think of the current procedure of returning a car?*

There is made an agreement with the family that the key can be dropped in the mailbox, this makes bringing back the vehicle for me much more pleasant than picking up the car.
The Locker is handy, but might be a bit complicated for some people. Older people might think this is too much of a hassle. This could be me, but I think this might be a problem for some. Maybe I should just do this sometime to really experience how this works.

**Application**

- *About what would you like to be informed better during the whole process of renting a car?*

The availability, this should be just like booking a holiday, that you can see the different dates and that they are green when available.
The location the car has to picked up is important, but it is not a deal breaker. For me, it would be nice to pick it up at the Koedijk, but it is not a problem otherwise.

- *What would you prefer? A website or an application for your mobile phone?*

For me, this does not really matter. If I had to choose it would be an app, but both could work. A web application might be useful for the people without a smartphone. There should be taken into consideration that the new system can be uses by older people as well. Those people are quite interested in Electric driving, but reserving should not be too complicatd.