D2.2 Catalogue of needs and requirements,

report on statistical data analysis results

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Introduction

The present document aims to outline the implementation and results of the interviews and the survey conducted with the target-groups (children, elderly citizens and people with impairments) and additional stakeholders (mobility service providers, providers of autonomous bus shuttles, policy makers, and spatial planers). A catalogue of the requirements of the target-groups towards inclusive, demand-oriented and target-group-specific automated mobility solutions for (semi-)urban areas will be presented, as well as the results of the statistical data analysis of the survey. Preceding to each, the paper will discuss the aims, approach, and applied methods.

The aim of Work Package 2.2 is to collect basic data and to include the stakeholders' perspectives on the requirements and needs related to inclusive, demand-oriented and target group-specific automated mobility solutions for (semi-)urban areas and to explore these mobility solutions for the target groups, as well as their impact on the mobility system.

To reach this aim, the following activities were conducted:

- Preparation of qualitative interviews and workshops with children
- Qualitative interviews with 11 senior citizens in Vienna, Austria
- Four workshops including focus group interviews with children in a primary school in Vienna, Austria
- One workshop as part of a summer leisure activity for children in Brussels, Belgium including a focus group interview
- Eight interviews with mobility service providers, spatial/traffic planners, public authorities, policy makers, and providers of autonomous bus shuttles
- Evaluation of the results from the qualitative data and building on that a composition of questions to evaluate the findings in a survey.
- An international survey in English, German, Swedish and Dutch directed at children, parents, elderly citizens, and people with impairments.

Connection to other activities in the project

The results of WP2.2 will serve as a base for WP2.3 – The development of the methodology of the field study and will help to identify typical situations related to accessibility and inclusion for specific user groups.

Qualitative interviews with senior citizens and workshops with children

1. Aim, methods, and procedure

The aim for the qualitative interviews and workshops was to gain basic data on the barriers, needs and requirements that elderly citizens (aged 65 or older) and children experience towards the use of public transport in general and towards inclusive, and demand-oriented mobility solutions in urban areas.

Due to the Covid-19 situation and contact restrictions it became relatively clear that, at least with senior citizens, it was not purposeful to do focus-group interviews. So, it was decided that for this target group only qualitative interviews with max. 2 participants in person and telephone interviews would be conducted. The mode of interview was chosen to be semi-structured.

For the children it was planned to do workshops within regular school or holiday activities to get access to many children in a productive working atmosphere. Within these workshops focus group interviews should be conducted amongst other activities such as games and drawing activities with informational value. Again, the mode of interview was chosen to be semi-structured.

1.1. Qualitative interviews with senior citizens

Material

For the qualitative interviews an interview guideline (see Annex I) as well as a short questionnaire collecting data about demographics and mobility behaviour (see Annex II) were employed.

The interview guideline included questions about the experiences, attitudes and personal behaviour of the participants in the following thematic areas:

- Personal mobility behaviour
- General public transport use
- Information / Ticketing
- Accessibility of bus stops
- Accessibility of buses
- Interaction / Consideration with / of other passengers
- Autonomous shuttles

At the end of the interview, participants were asked about the barriers, they experienced on their way to the interview and how this trip and its conditions would look like for them in a perfect future.

Recruitment

Participants were recruited with help from the aspern.mobil LAB in Seestadt Aspern, Vienna. They shared the invitation to the study on different social media networks, email-newsletters, on their webpage, and printed posters that were hung in Seestadt Aspern. Additionally, the

researchers from Factum asked around in their personal networks. The incentive for the interviews was a 25€ voucher for the Austrian railroad company (ÖBB).

In total 11 participants took part in the interviews. Four were male and seven female. The mean age was 71,9 years. Six of the interviews were in-person interviews and five telephone interviews.

Procedure

The in-person interviews were conducted outdoor in Hannah-Arendt-Park in Seestadt Aspern in Vienna, Austria. In the invitation e-mails, the participants were informed about the location of the interview and how to get there. They were also informed, that they have the possibility to take an autonomous shuttle, running in Seestadt, to get to the interview.

After arrival, the participants were informed about the project and the purpose of the interview and were asked to fill in an informed consent form as well as the short questionnaire about their demographics and mobility behaviour. After that the interviewer began the interview according to the interview guideline. During the interview a short video informing about autonomous buses was shown via a smartphone. After the interview the participants received the incentive and were dismissed.

For the telephone interviews, the participants received the information about the study together with the informed consent form and the short questionnaire via e-mail with the request to fill it out and send it back. The participants were again interviewed according to the interview guideline and the interviews were recorded. The participants watched a short informational video about autonomous buses on their own devices. In this case the incentive was sent via e-mail.

After the interviews the voice recordings were transcribed and analysed using qualitative content analysis.

1.2. Workshops with children

Material

For the workshops three different interview guidelines (see Annex III) were developed, one concerning the trip to bus stop, one concerning bus stops, and a final one concerning the buses. The three different interview guidelines asked the children about their experiences, attitudes, and personal behaviour regarding public transport and accessibility.

A popular game from a German children TV-show called "1, 2 oder 3" was adapted to measure the children's mobility behaviour and knowledge about autonomous busses. In this game the researcher asks a question with three possible answers and the children answer by standing in one of three respective fields that are drawn on the ground. Questions for this game were compiled (see ANNEX IV), as well as graphic material and a document to count the answers.

Recruitment

Workshops with children were organized in Vienna, Austria and Machelen near Brussels in Belgium.

For Vienna the aspern.mobil LAB in Seestadt Aspern made initial contact with a primary school in Seestadt and connected the research team with teachers from the school. The school organized four classes (a 1st, a 2nd, a 3rd, and a special education class) for two days in the week before the summer holidays. The workshops took place in Hannah-Arendt-Park in front of the school. The children were aged 6-14. A total of 77 children participated in Vienna. The first-grade class consisted of 24 children, the second-grade class of 25 children and the third-grade class of 22 children. The special education class consisted of 6 children. In this class not all the questions could be asked. The teachers handed out the informed consent forms to the parents together with information about the project weeks ahead of the workshops and handed the signed forms back to the researchers on the day of the workshop.

For the Belgian case, various schools were approached via e-mail in the regions of Brussels and Flanders. We obtained a positive response from Speelplein Machelen. This is a summer school where kids attend to have fun activities from Monday to Friday. The first contact was Youth consultant of the municipality of Machelen, to whom we explained the activity's objective. There was a second meeting with the instructors of the children. The parents of the children who agreed to participate in the activity signed a consent form. A total of 18 children participated and their age ranged from 9 to 14 years old. The game was in Dutch but the instructors had to translate in some cases as some children were mainly French speakers.

Procedure

The overall procedure was the same in all workshops, except for the special education class. The procedure for this class will be described later.

The children were welcomed and got a name tag. After that the game 1, 2 or, 3 was played, where children answered questions about their mobility behaviour and knowledge of autonomous busses.

After this game, the children were divided into three separated groups for focus group interviews. Each group had a different interview topic: The way to the bus stop, the bus stop, or the bus. The interviews were conducted according to the interview guideline and were recorded.

After the interview the children were asked to draw with chalk what they imagined the ideal future, depending on the interview topic they had, should look like. That means children from the bus group draw their ideal of a future bus, the children of the bus stop group their image of an ideal bus stop and so on. During their drawings the children were asked about what they included and what was important for them. Pictures of the final drawings were taken.

After that, the children had the possibility to look at other drawings, ask questions and add points that weren't mentioned before. As the closure of the workshops the children gave feedback how they liked it, they got some sweets and there was a little game involving soap bubbles.

The procedure for the special education class was more open, due to uncertainty which of the tasks the children in this class were able to perform. Finally, some of the questions of the interview guidelines were asked to the children, but as well to the teachers of the class. Some of the children also drew their ideal of future busses.

After the workshops all interviews were transcribed and the collected data from the different games was analysed using qualitative content analysis.

2. Results

Subsequently the results of the interviews with the elderly citizens and the children are displayed. In each section first demographic and personal mobility related results are shown followed by the barriers, needs and requirements towards public transport and autonomous vehicles. We start with the results from the senior citizens.

2.1.   Senior Citizens

Mobility behaviour

To begin with the results from the demographic and mobility behaviour questionnaire it showed that the main mode of transport was primarily walking, followed by public transport, and cycling. For only two participants the main mode was taking the car, which can lead to conclusions regarding a bias in our sample. These results are presented in Figure 1 below.
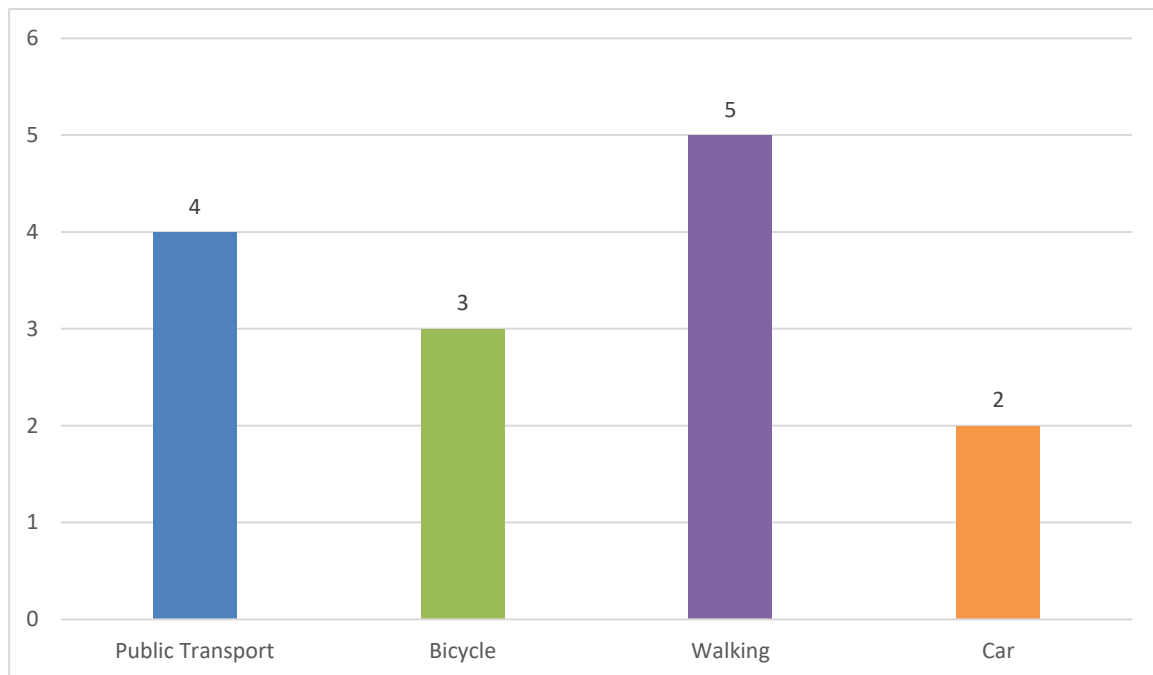
Figure 1: Main mode of transport of the senior citizens in the qualitative survey

In Figure 2 we can see, that six of the senior citizens use public transport at least a few times a week while eight of the participants use it less often.
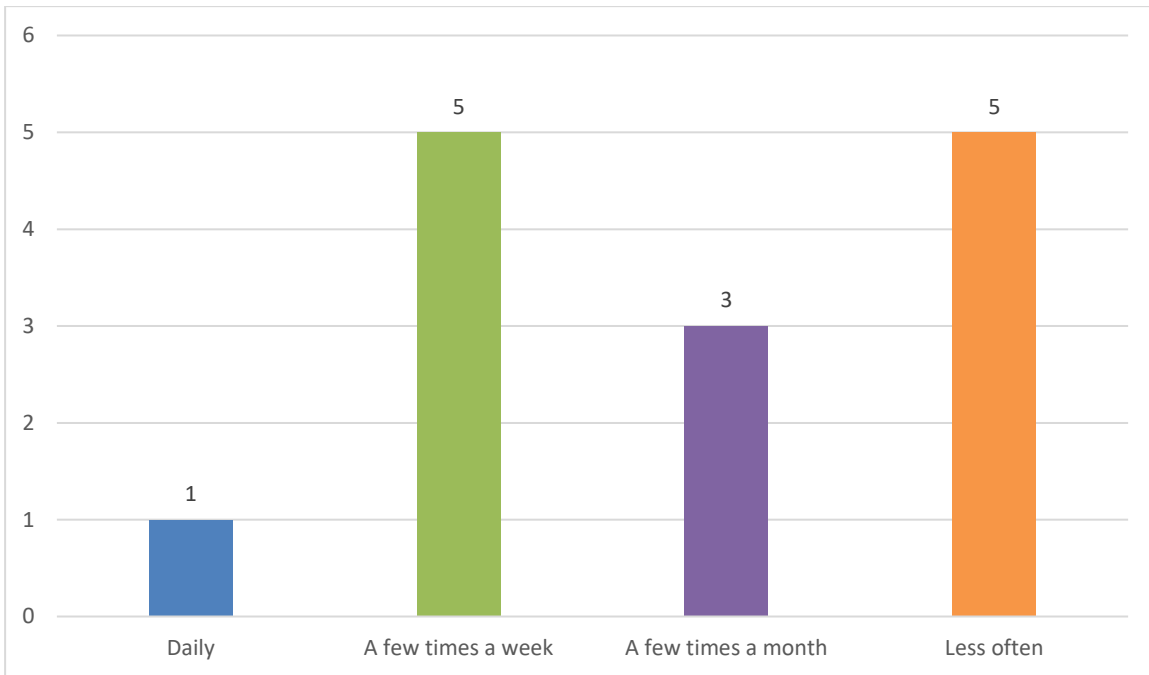
Figure 2: Frequency of public transport use of senior citizens in the qualitative survey

Nearly all of the participants use public transport to visit friends and relatives while some also use it for shopping, daily errands and leisure activities. The interviews confirmed the diverse choice of mode and showed diverse underlying reasons for the choice.
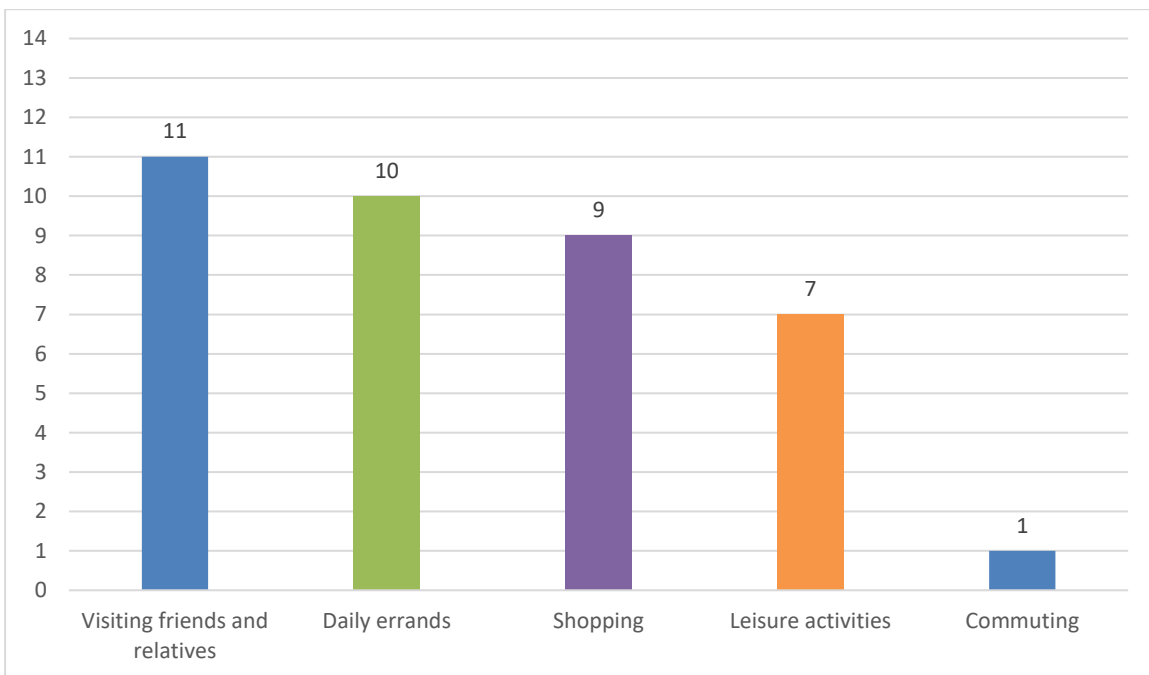
Figure 3: Purpose of use of public transport amongst senior citizens in the qualitative interviews

Barriers of senior citizens towards public transport

Pedestrian unfriendly infrastructure

The participants reported that pedestrian unfriendly infrastructure on the way to stops can depict a barrier for the use of public transport. This includes unsafe road crossings with fast cars, too few road crossing possibilities, inconveniently turning traffic lights (too short, wrong timing for the departure of bus, long waiting times), stressful shared spaces with cyclists, to narrow pavements.

Insufficiently equipped stops

Insufficiently equipped stops can depict a barrier for senior citizens. Amongst the missing features are seating and storage possibilities, weather protection, illumination, toilets and trash cans.

Lack of relevant information at the stop

Some participants reported that stops with a lack of relevant information are a barrier for them. Up-to-date timetables are missing, there is no real-time information (departure, accessibility, line, etc.) about the next bus displayed, and announcements are not understandable. When multiple busses depart at one stop, the participants need the information, which bus departs where. Signage and information need to be better visible and more readable. A map of the surrounding is also relevant.

Difficult access due to steps/stairs

Stairs are generally a difficulty for the participants we asked, be it on the way to stops, at the stops or on the vehicles itself. On the way to stops and at the stops there should be alternatives to stairs, such as ramps, elevators or escalators and vehicles should be low-floored.

Too few seating and holding options on buses

The senior citizens that were interviewed remarked that the seating options on busses are too few and not always comfortable. Also, holding options are too few or in non-reachable distances.

Lack of contact persons in public transport

Many of the participants rely and like to rely on other persons when using public transport – be it asking for the way or buying tickets. They perceive that these personal contacts decrease and perceive it as a barrier that they cannot just ask someone for help or information. Some of them still want to buy their tickets from human persons.

Ticket purchase at ticket machines, online or on smartphones experienced as difficult

The type of ticket purchase and the perceived difficulty varied throughout the participants. Although some of the senior citizens buy their tickets from vendor machines regularly, others find it difficult to comprehend how to get the right ticket. The same is true for buying tickets online. None of the participants we asked buy their tickets via smartphone and most of them do not think they will learn how to do it or want to do it. However, some use their smartphone to search for connections or the timetable.

Low frequency of buses

Many of the senior citizens noted, that they would use public transport more often, if it would ride more frequently. Some of the senior citizens even mentioned, they would leave their car at home more often, if this was the case.

Needs and wishes towards future mobility in general

Ticket purchase and reservation must be possible "offline"

As mentioned in the barrier section, senior citizens struggle with getting tickets from vendor machines, online or via smartphone. It is important for them in the future to get their tickets offline, be it on vendor machines or on a counter.

More space and respect for pedestrians

Most participants sensed that there is too much space for cars in comparison to pedestrians. They wish for a different distribution of space and for example broader pavements. The senior citizens also wished for more respect of drivers of cars and bicycles towards pedestrians, for example when crossing the streets.

Fewer cars and shared traffic areas

Senior citizens perceive traffic zones that are shared with cyclists and motorised vehicles as stressful, due to the need of being attentive. The same applies to streets with heavy car traffic. The participants wished for less car traffic and fewer shared traffic areas.

Needs and wishes towards autonomous buses

Presence of a responsible person

Nearly all of the participants stated the wish or need for a responsible person on the bus. Some stated, that they would not use an autonomous bus if there was no such person on board, others stated that they would just use a bus without a responsible person if they had to. The fear did however not so much concern technical errors of the bus but safety issues in case of an emergency. The senior citizens want someone, who oversees things in case of something unforeseen is happening and who they turn to for help. Generally, they dislike the idea that human interaction gets lost due to automatization and digitalisation.

Direct connection (emergency button/intercom) to human person

The senior citizens wished that in case of an emergency there must be a device on the bus that establishes a direct connection to a real person. It was important to the participants that there is a highly visible and audible device that would depending on the emergency directly call an ambulance, the police, or someone from the mobility service provider who can intervene. There must be a real person on the line immediately. A chatbot or automatic phone response was seen as unhelpful.

Doors must open immediately in case of emergency

In a case of emergency, it must be possible to exit the bus right away. The senior citizens feared that they might be trapped in there without anyone who could help.

Video surveillance more desirable

A majority of the participants wished for video surveillance on the bus due to safety reasons. Even though, some of the participants expressed doubts about constant video surveillance that is present everywhere, they expect that an autonomous bus would not work without surveillance.

More comprehensive passenger information needed

Information on the bus and at the bus stops must be comprehensive but simple enough for passengers to be able to use the bus without help. Although the senior citizens expect the communication to be worse than today, they emphasize the need of the busses to be more communicative and informative than today. That means clear instructions on what to do and the possibility to inform oneself about any question one might have about the travel (changing vehicles, arrival time, maps etc.). It is important to them that this information is also available non-digitally. The participants also expressed concerns about technical failures and the functionality of the bus. Therefore, it is necessary that the bus also communicates, what it is doing, what it is "seeing" and how and why it is reacting.

Relaxed driving

Participants wished that autonomous vehicles would drive less aggressively than today's bus drivers. This would make rides safer and more comfortable. They should be more considerate towards other road users and for example leave more space when overtaking cyclists. However, the participants differed when specifying the maximum speed of the buses - from 30 km/h to 80km/h.

Attention to the introduction of autonomous vehicles

Participants noted the importance of the phase when autonomous vehicles are introduced. There must be broad information campaigns and courses on how to behave towards autonomous vehicles and how to use them.

Hardly any additional benefits expected

The participants that were interviewed expect nearly no additional benefit from autonomous buses. There is no feature that would make an autonomous bus more pleasant, helpful or useful in comparison to today's buses. At the same time the possibility to have someone on the bus who can help with information or getting on the bus would disappear. However, some of the participants saw an opportunity, if autonomous buses would work as an on-demand service without fixed stops, that would stop in front of the own door. Some participants also expect, that an autonomous bus would make less mistakes than a human driver.

2.2. Children

<u>Mobility behaviour</u>

The data regarding mobility behaviour of the children stems just from the tests in Austria. It was not measured for the tests in Belgium. The data showed that most children (87% or 67 children) got to school by active means of transport (walking, scooter, cycling) and only 6% (= 5 children) use public transport or cars to get to school (see Figure 4). This high value of active mobility is explained by the children's place of residence. The Seestadt in Vienna is considered a showcase project with regard to the design of public space and the distribution of traffic space among the different road users.

In comparison, according to the mobility study "Aktive Mobilität in Wien" [1], 48% of 6-10 year old children walk to school, 5% cycle, 34% use public transport and 13% are taken to school by car.

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[1] Heller J. 2021: Aktive Mobilität in Wien. Vertiefte Auswertung des Mobilitätsverhaltens der Wiener Bevölkerung für das zu Fuß gehen und das Rad fahren
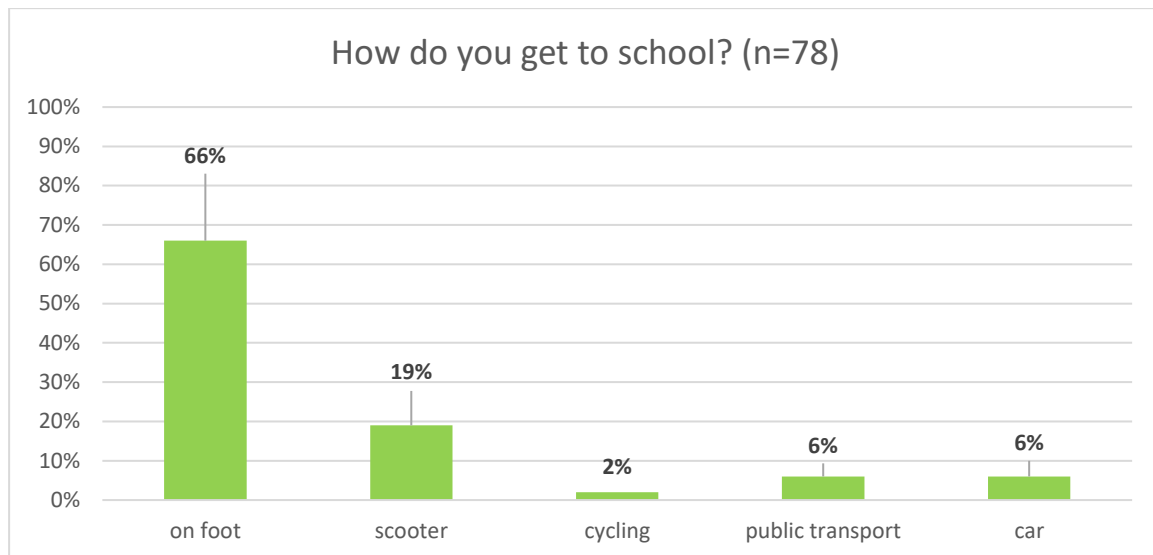
Figure 4: Modal choice on the way to school of the children in the workshops

The children's wish for how to get to school differs from the actual choice of transport. Only 16 children (21%) would then walk. Instead, more would ride a scooter (18 children = 23%) and a bicycle (10 children = 13%). More children would also use public transportation (12 children = 16%), as well as choose the car as a means of transportation to school (21 children=27%). Figure 5 shows these results.

Walking is perceived as slower and exhausting, while the car is experienced as cosy, comfortable, stress-free and relaxing, and the scooter and the bike are also rated as faster. Those who prefer to travel by public transport find the autonomous bus in particular to be cool or simply enjoy using public transport.
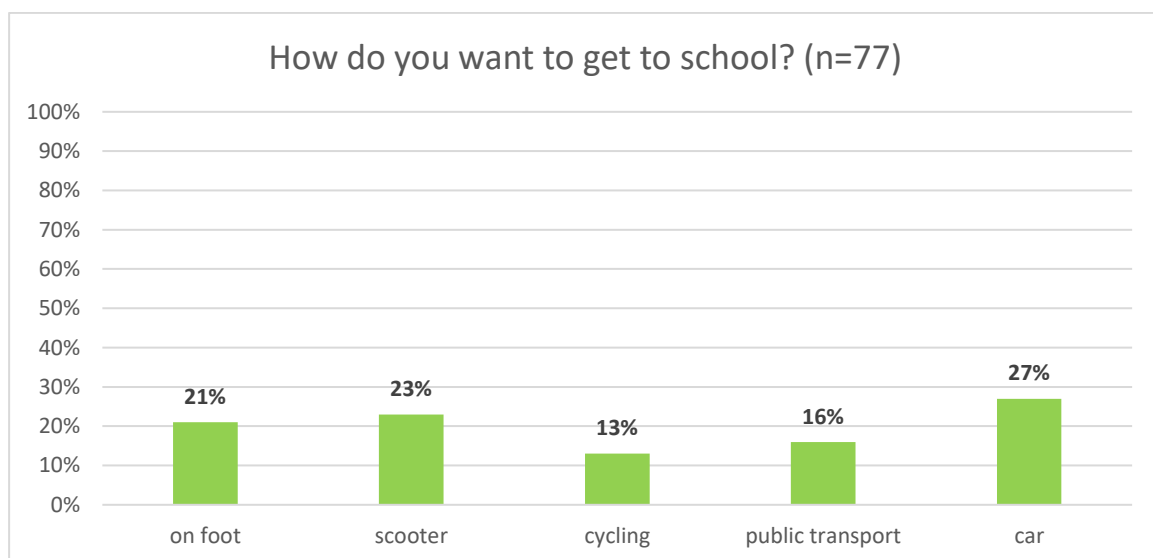
Figure 5: Favoured mode of choice on the way to school of the children in the workshops

As Figure 6 shows, 72% of the children are already allowed to go out on the streets without accompaniment by parents. However, the quarter where the children live is designed to be children-friendly and safe. Hence, this number might be untypical for children in other urban areas. Of the 28% of the children that were not allowed to take part in traffic without adults,

half would like to participate without them. The proportion of children who travel alone increases with age. While around 40% of children in the first and second grades have never been out and about alone, only one child in the third grade stated that he or she was always accompanied.
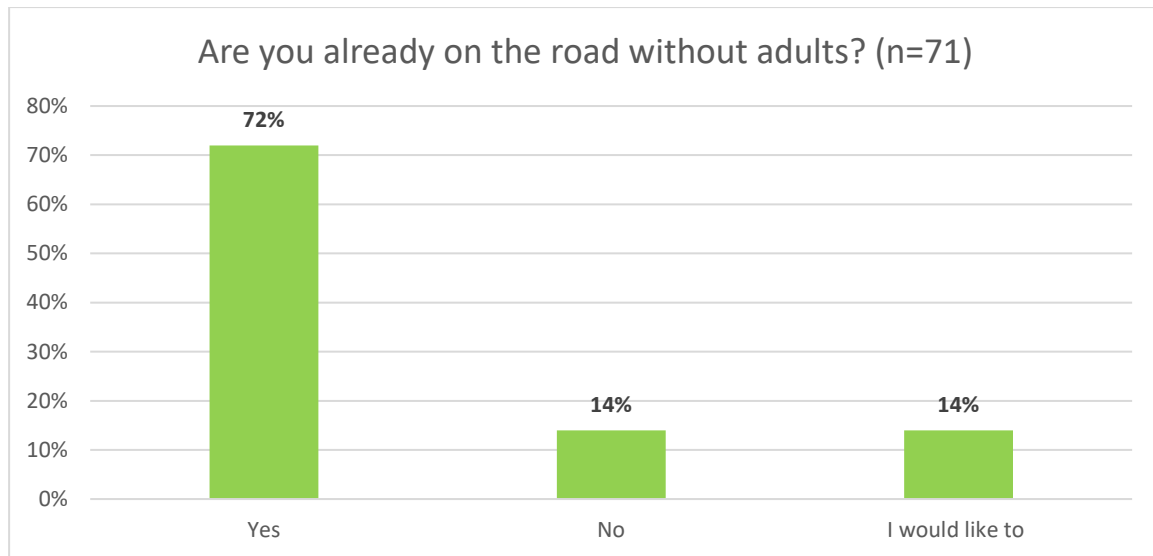
Figure 6: Children's answers on whether they are allowed to go on the road without adults

66% of the children in the workshops do not use public transport without their parents. In total 34% are allowed to use public transport alone. While in the first grade 21% are allowed, the number increases in the second grade to 32% and in the third grade to 50%. Figure 7 shows these results.
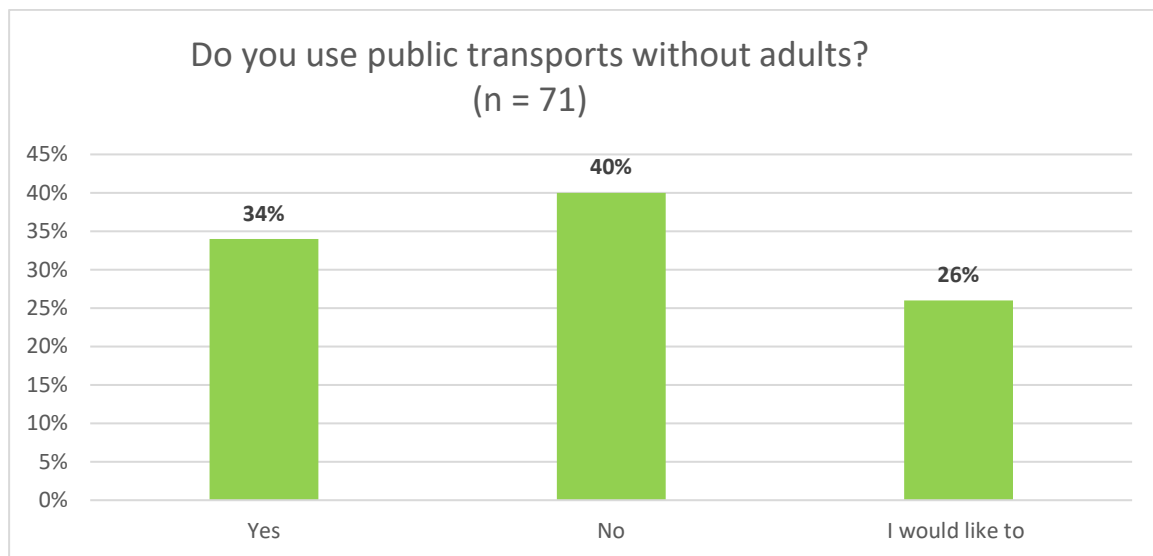
Figure 7: Children's allowance to use public transport without adults

72% of the children know what a bus timetable is and used it in the past. 11% have not used one in the past but know what it is while 17% did not know what a bus timetable is.

Have you ever used a bus time table (n=71)
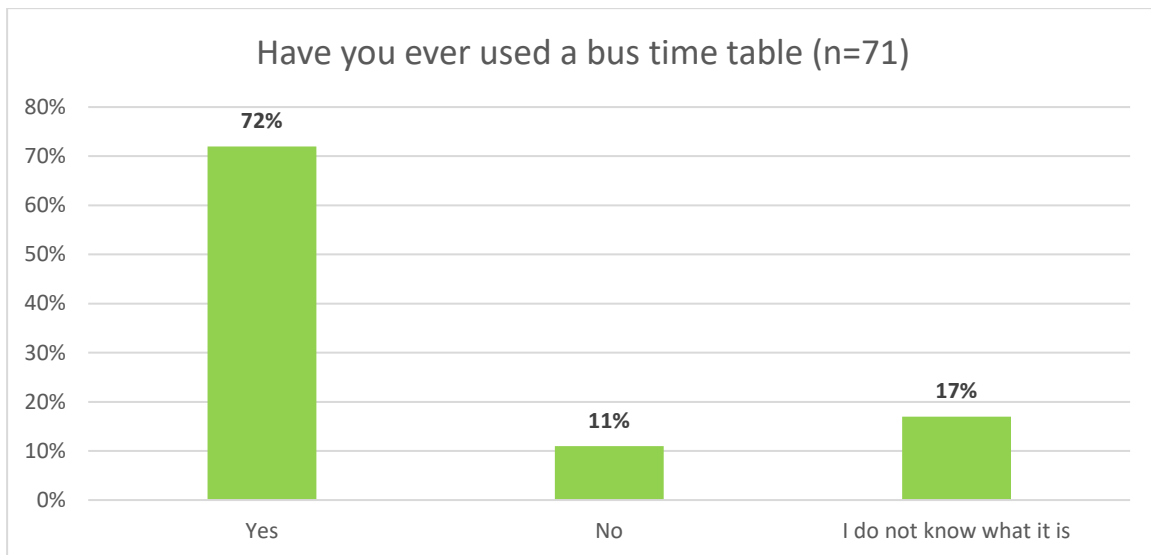
Figure 8: Children's usage/knowledge of bus timetables

The children were asked to line up on a barometer with the poles "I like public transport very much" and " I don't like public transport" depending on their opinion. Table 1 gives an overview of the positive and negative aspects of public transport use from the children's point of view.

Table 1: Children's assessment of public transport

| What do you like about public transport?	What don't you like about public transport?
- Reach your destination quickly - Public transport is cool - Standing on the moving connecting pieces on the continuous subway is fun - You can look out the window, especially cool if you take the subway over the Danube bridge - There is a TV on the bus - You can ventilate - You get to know new things	- No possibility to go to the toilet - lots of chewing gum - Environmental pollution – high CO2 emissions of the bus, public transport requires too much energy - Eating and drinking is not allowed - Changing trains is exhausting - Driving by public transport is boring - It's dirty and stinks - It's either too hot or too cold - It's noisy - Many people are uncomfortable - Many people do not follow the rules e.g. do not wear a mask against COVID-19 infection - Riding the subway is stressful e.B. Fear of not being able to get off when many people are in the subway or falling into the gap - Grab handles are too high, there are always missing rods to hold on - There are too few wheelchair spaces - No comfortable seats

To find out, whether the children know what a driverless bus is, they were asked a quiz question with a right ("A bus that drives by itself) and two wrong answers ("A bus that drives without passengers", "A bus that cannot drive"). 92% of the children correctly identified, what a driverless bus is. The answers can be seen in Figure 9.
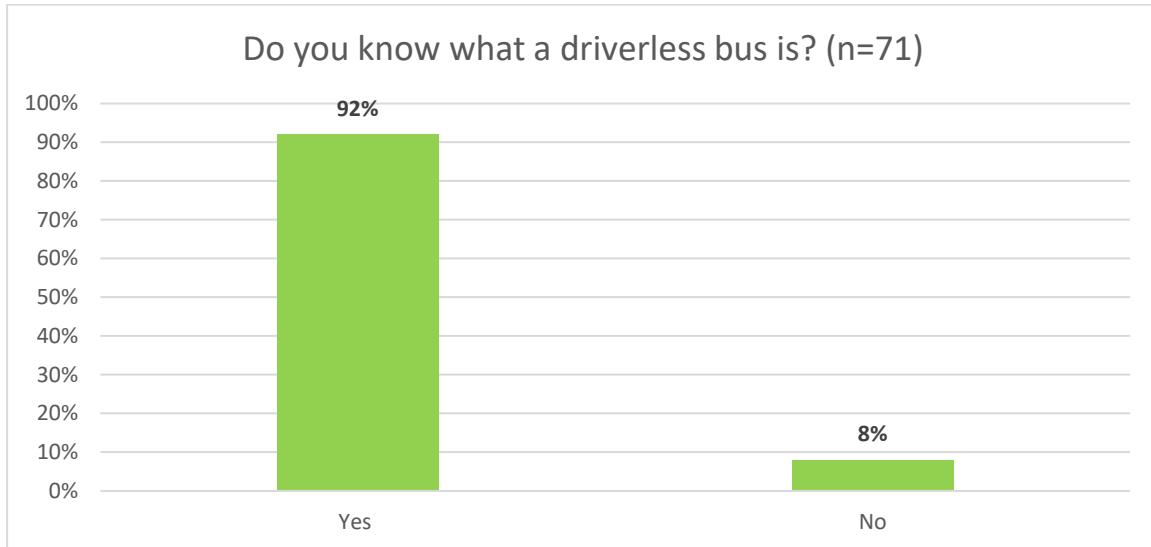
Figure 9: Knowledge amongst children about driverless buses

Due to an autonomous bus shuttle operating in the quarter where the school of the children was located, the children were asked, if they used this shuttle before. As can be seen in Fugure 10, 46% did use the shuttle before and explained on one side that they have no fear using it, that it is great that there are more bus stops and it is good but on the other hand as being slow and boring, while they would be afraid using it without a bus driver. 54 % did not ride with the autonomous shuttle before and 30% of the children indicated that they would like to use it.
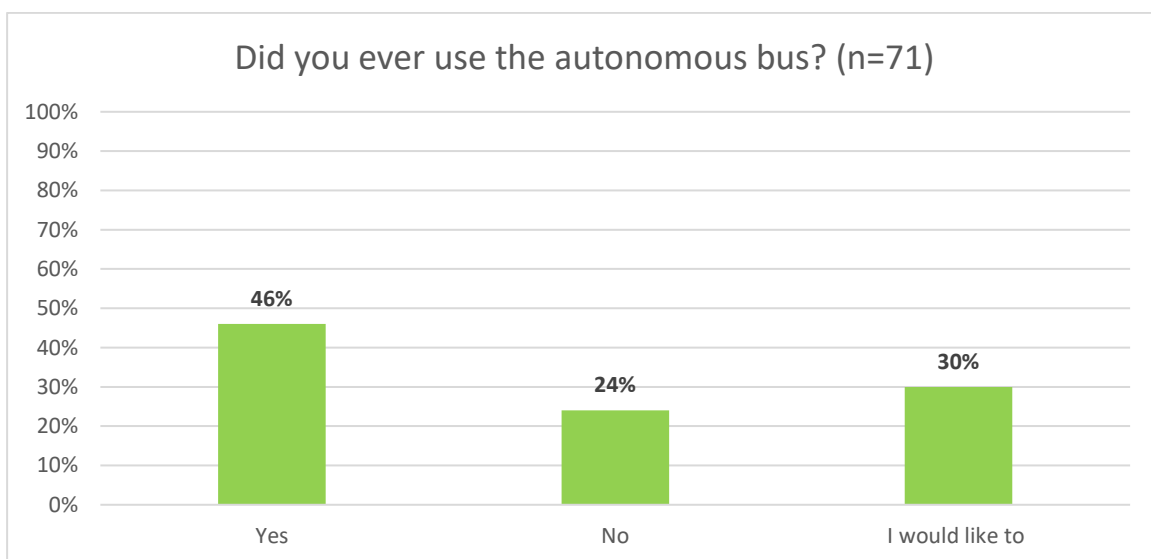
Figure 10: Usage of an autonomous bus amongst the children

Barriers of children towards public transport

Getting on and off the bus is perceived as difficult

Many of the children had very strong emotions towards getting on and off of buses. This stems from the children feeling too small between large adults, too many people that stand in the way and an annoying wait for others to leave the vehicle. Some children also reported a fear of stepping into the gap between the vehicle and the curb.

Crowding in public transport very unpleasant

The children reported that they find it awful to shove through crowded vehicles. Vehicles can be too full, especially before and after school and when taking school trips. It can happen that a bus is too full and one has to wait for the next vehicle to get on.

Lack of cleanliness in public transport/stops

One of the most mentioned criticisms towards public transport in general was a lack of cleanliness and bad smells. The children are very aware of this topic and have strong opinions towards dirt and intense odors.

Not enough possibilities to hold on to things, to sit and to park things

A barrier that was mentioned often by the children was a lack of possibilities to hold on and to sit. Due to the size of the children, they are not able to reach to the rods and loops at the ceiling. And on the level of the children there are too few rods. It was reported that standing for longer than two stops is exhausting, and they'd rather sit for longer distances. However, the children reported that often all seats are already occupied, which makes the travel very inconvenient. Also, the seats are built in a way that when the ride is juddery it can lead to falling of the chair. The children also expressed their needs to have a place where they can put their luggage.

Fear of other people (especially teenagers) and strangers

The children wished for more security personnel e.g. at bus stops. They were aware of a recent murder of a teenager in Vienna, frightened of older bullies at school and of big dogs. A general need for more safety emerged in the interviews.

Crossing streets at stops without traffic lights is difficult

The children expressed that crossing streets at bus stops can be difficult. They are scared of cars that they did not notice before, drivers that do not stick to the rules and go to fast and cars that drive close to the pavement. It was also reported that it is hard for them to tell whether a car will stop for them and let them pass or not. Thy often just realize it, after the car has already stopped. Generally, the children were glad that there are just very few cars around where they live.

Toilets at bus stops are missing

Another barrier for children in public transport seems to be a lack of toilets. The children remarked that there are too few free public toilets at bus stops and in public transport in

general. When taking longer trips with public transport, they wish for the possibility to use a toilet.

Missing weather protection

Children report of insufficient weather protection a bus stops. In the case of rain, the roof is too small for all passengers to fit under. The bus shelters must be large enough and protect from wind and rain.

Unpleasant temperatures and air in public transport

During the interviews the children reported that the temperatures are often either too high or too low in the buses. They wish for air conditioning that can solve that problem, filter the air, and exchange bad smelling air with fresh air.

<u>Needs and wishes towards autonomous buses</u>

Information displayed in large font and positioned to be readable

Every sort of information must be written readable and obvious, be it the name of the bus stop, the information on the display on the bus, or the timetable. The information needs to be simple, visible and understandable. And the information must be located in a way, that small children can read it, and not too high up. Timetables and route maps are important.

Better bus stops

To make waiting times at bus stops more pleasant, the children wish for multiple improvements: There should be a clock at every bus stop and displays that show the arrival of the next vehicle, more flowers and trees, more water elements, bins, possibilities to play (e.g. slides), more shops in the surrounding, and more benches.

Entertainment

Many children expressed that they are bored on public transport. They wish for more entertainment possibilities directed at children. Most wished for screens that show movies or have the possibility to play games on them

More colourful design

The children wished for a more colourful design of public transport in general. Today, everything looks the same for them and they wish for more variety and unusual design.

Responsible person on board desired

The children wish for a driver or responsible person that is present on the buses. While they would be okay with the bus driving autonomously, they cannot imagine going on a bus without any responsible person on board and some are afraid of it.

Security and safety features

The children wish for more security features such as SOS buttons and more security personnel. They also asked for safety belts and more possibilities to hold on when standing.

Comfort

The children wished for more seats in autonomous buses for a more comfortable ride. They also expressed the wish for more and larger windows (e.g. also on the ceiling), to be able to watch the surroundings better.

Electric propulsion

The children are very aware of climate change and want environmentally friendly forms of transport. That's why the wish for autonomous vehicles to be electricity driven.

On-demand

The children wish for autonomous vehicles to drive more direct routes without stops in comparison to today's public transport. They also wished to book the bus via smartphone, typing in the destination and then expecting the bus to collect them and bring them there. These two statements lead to the conclusion that the children would like an on-demand service of autonomous vehicles.

Interviews with additional stakeholders

1. Aim, methods, and procedure

In addition to the interviews with the target groups, eight interviews with stakeholders from the domains mobility service providers, spatial/traffic planners, public authorities, policy makers, and providers of autonomous bus shuttles were conducted. The aim was to find out about their requirements towards the implementation of autonomous bus shuttles, what todays autonomous shuttles can offer towards the target-groups of our project, possible conflicts in implementation of autonomous bus shuttle and the needs and requirements of our target-groups and the benefits, that autonomous shuttles might bring. All interviews were conducted in Belgium in the regions of Brussels and Flanders.

The interview questions were semi-structured, and the questionnaire was generally divided into three topics: 1) Self-driving shuttles, 2) User groups and 3) North Brussels. Yet there were some variations to tailor the questionnaire considering the interviewee's expertise. An example of the questions can be found in Annex V. To identify and select the interviewees, we contacted a planner and researcher from the department of environment and spatial development Flanders via email from Noordrand and asked for his support. The aim was to recruit a number of actors that allowed us to cover the quadruple helix. In the case of the governmental actors, we considered local and regional governments. The interview with the planner included an excursion to the Noordrand area, while the other interviews were online.

2. Results

Features of today's autonomous shuttles that allow / restrict accessibility

The stakeholders mentioned different factors that can make the usage of autonomous shuttles easier for the target groups of our project: There are at least 8 seats on a bus shuttle, there is a place for a wheelchair, and doors on both sides of the vehicle. The bus doesn't require the digital applications to use it and it can be operated by buttons, which can also be an advantage for visually impaired persons. The shuttle has got a ramp, so wheelchair users can board it. However, one stakeholder estimated that even with such a ramp there are still too many barriers for persons in wheelchairs to use such a bus. Additionally, the shuttle has got video surveillance.

Restricting factors of today's autonomous shuttles are amongst others the lack of seatbelts. Today's shuttles are also described as too quiet and therefore dangerous. Children and elderly people need to get used to it or trained in order not to be endangered by them. Another stakeholder also criticized that mobile applications for the use of public transport today are still too complicated to use today for senior citizens.

Possible benefits of autonomous shuttles for the target-groups

The stakeholders see the potential of autonomous shuttle for the target-groups in our project mainly as a connection for the last mile. It can be an important solution for elderly citizens, that do not own a car, are not able to drive a car, or want to give up driving to stay mobile. Another benefit can be that children do not have to be driven to daily activities but can take a bus shuttle. The stakeholders think that bus shuttles would need to have shorter travel times than cars and a lot of comfort to bring a benefit for passengers and thereby guarantee actual usage of the shuttles.

However, these benefits may be restricted: Some of the stakeholders think that bus shuttles would only work in an urban context and only for specific target-groups. Another stakeholder mentioned that autonomous shuttles could only be a breakthrough if the stop in front of the passengers' doors and elderly people wouldn't need to cover longer walking distances.

Conflicts of interest

It showed that there were many possible conflicts of interest that can arise when the aim is to integrate a working business model for autonomous shuttles and inclusion of the target-groups of our project.

The first possible conflict is that autonomous shuttles may constitute a threat towards active forms of mobility (walking, cycling). For an autonomous shuttle to work nicely and fluently, it would need to get as many priority situations in traffic as possible and need to be separated from other road users. This could lead to a disadvantage of our target groups, especially pedestrians and cyclists in traffic and potentially a loss of usable public space. While some stakeholder suggested that autonomous shuttles could use bike lanes, others strongly disagreed out of practical and safety reasons. There was also a concern, that shuttles could replace the more sustainable modes of transport, walking and cycling, and children might take the shuttle for the last mile instead of using and thereby learning the active modes of transport.

According to the stakeholders, one of the main requirements to implement an autonomous bus shuttle on a route is that there is a strong demand that reaches a certain number of

passengers per hour. And if this number is undercut it is financially unreasonable. However, the routes and locations that the target-groups in this project might take and visit or the areas in which they live, might be not as frequented as necessary. It is possible that school children, persons with impairments and elderly citizens are not enough to make such a shuttle financially viable. Also, autonomous bus shuttles mostly have a rather limited capacity and are therefore unsuitable for peak hours, such as the beginning or the end of school and therefore maybe unsuitable for the daily use of children. In the end business considerations might be more important for the implementation of driverless busses than the needs of our target-groups.

One stakeholder mentioned, that for such a service to be attractive, there must be a balance between operating speed and frequency. However, this means that there will be higher financial expenses or less attractivity for the user.

Another conflict of interest that the stakeholder described, is who to develop the shuttles and the routes for: Does one start focusing on children, elderly and persons with impairments and then integrate the general public, or should they start with the general public and integrate the other ones afterwards. Also, shuttles might be installed for a certain need or for a specific target group (e.g. commuters to a specific location), without taking into account other possible user groups. One stakeholder generally questions whether the requirements of different target groups such as elderly and commuters can at all be integrated.

A conflict of interests may also be in the implementation of autonomous shuttles as an-on demand service or on a fixed route. As mentioned by a stakeholder earlier, user groups would mainly benefit from autonomous bus shuttles if they'd be operating as an on-demand service. However, it is easier and less complex for autonomous shuttles to drive on fixed routes. The question arises, which of the alternatives will prevail.

Another conflict of interest lies in the infrastructure. Autonomous buses (today) are very dependent of an appropriate infrastructure for their service and can only be implemented in a useful way if the infrastructural needs are fulfilled. However, this dependency on the infrastructure could lead to the case that an autonomous shuttle is not implemented in a valuable way for the target-groups due to missing infrastructure. Another point by the participants was that autonomous bus shuttles must not be used as a remediation for bad walking and cycling infrastructure.

One more conflict of interests lies, according to the stakeholders, in the danger of adding more vehicles to traffic instead of reducing it. It is important that the aim of autonomous bus shuttles should be that they drive instead of cars and not additional. Also, there is a risk of unnecessary travel by autonomous busses and more congestion.

Quantitative survey

1. Aim, methods, and procedure

The aim of the quantitative survey was to quantify the significance of the needs stated in the qualitative interviews. The survey was directed again towards children and senior citizens but also towards persons with impairments and parents of younger children.

Questionnaire

To assess the needs stated in the interviews in a quantitative way, it was necessary to derive questions out of the most common needs stated in the interviews, since asking about every need stated would have been beyond the scope of this questionnaire. In a deductive process starting with the complete list of stated needs it was tried to deduct common themes out of the needs, to combine different needs in one question, to filter out the most important needs and delete less important needs and needs that are not at all related to autonomous busses. The resulting 14 questions can be found in the ANNEX V. In the questionnaire the 14 items were asked using a 4-point Likert scale asking for the approval to those 14 statements as well as the possibility to choose an alternative option ("I don't know").

Additionally, we added a question block consisting of 9 items for the evaluation of autonomous bus shuttles in comparison to regular busses. For example: "I think that in comparison to a conventional bus a driverless bus is..." ranging from 1 = "more punctual" to 6 = "less punctual". These items can also be found in ANNEX V.

Participants were also asked about their demographics (age, gender, impairments, number of children) and their mobility behaviour (usage of public transport, emotions towards autonomous vehicles and if they ever rode an autonomous bus shuttle).

The questionnaire was created in German and translated into Dutch, Swedish and English. There was also a version in German directed towards children applying a simpler language.

Recruitment

The target group of the questionnaire were people with impairments, people over 65 years, children under 16, and parents with children under 14 years.

The questionnaire was created both, as a pen-and-paper questionnaire, and an online questionnaire using soscisurvey.de. The pen-and-paper version was handed out to participants of the field tests in Austria (WP3.1) as well as in professional and personal circles. The online questionnaire was also distributed amongst senior clubs, via professional and personal circles, the ICTCT newsletter and the CATAPULT project homepage.

122 persons started the online survey and 92 finished it. In the field studies, 48 persons filled a pen-and-paper questionnaire, so did 4 additional persons. In total there were 144 completed questionnaires. 26 more cases were filtered out for not fulfilling the recruitment criteria leaving it to 118 valid questionnaires.

Procedure

In the beginning of the questionnaire, participants were asked in which language they'd like to participate, informed about the procedure, the content, and the privacy of date of the questionnaire, as well as contact details of the responsible organisations and were asked for their consent. Subsequently, the participants were asked about their demographics and mobility behaviour, followed by questions related to their needs towards autonomous busses. Concluding, the participants were asked about their attitudes towards autonomous busses, asked if they had any other remarks and thanked for their participation. Once again, the contact details of the responsible organisations were displayed.

2. Results

<u>Demographics</u>

Age

The mean age was 48.55 (sd=24.30). 31 of the participants (26.27%) were children (aged 15 and younger. 49 of the participants (41,53%) were aged 65 and older. Age was not distributed equally amongst different age groups, which was naturally due to the defined target groups. Therefore, in Figure 11 we can see peaks at the ends of each side: Children and elderly. The youngest participant was 9 and the oldest 85.
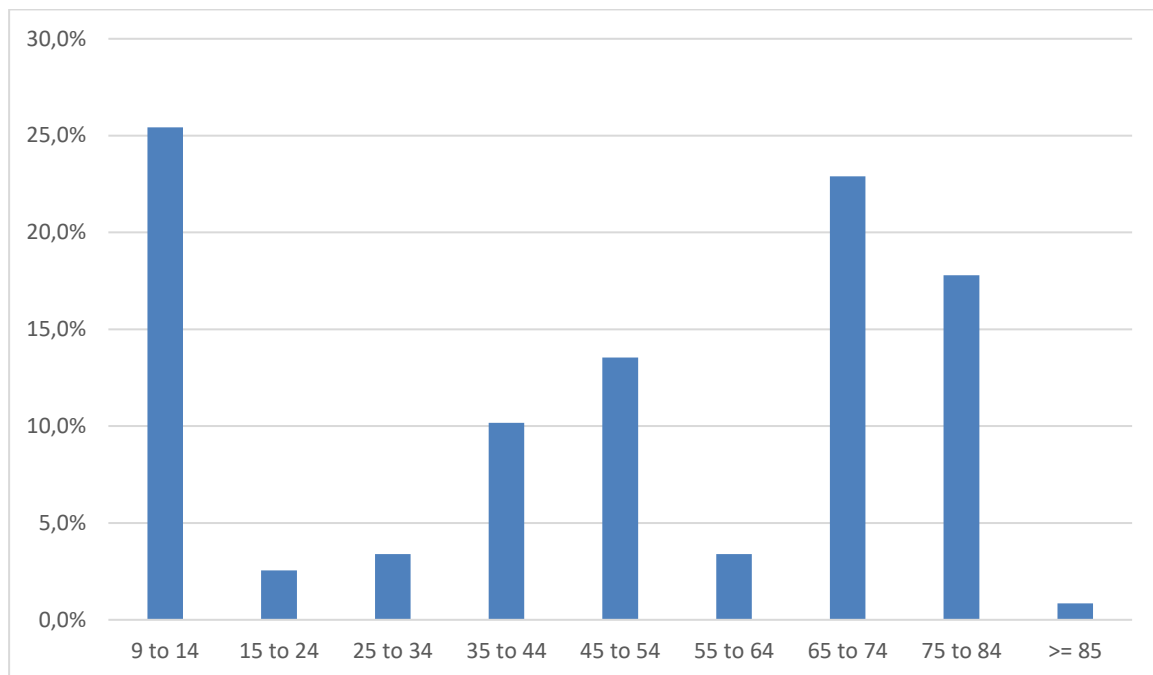
Figure 11: Age distribution

Figure 12: Gender distribution amongst the participants
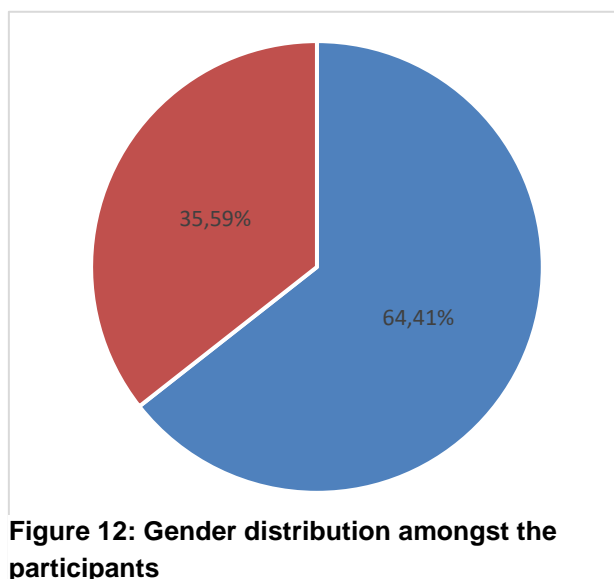
Gender

76 of the participants of the study were male and 42 female (Figure 12).

Language

The questionnaire was handed out in different languages. 72,03% of the participants filled it out in German and it can be concluded that they mainly stem from German speaking countries. 16 people filled out the Swedish version, 12 the English version and 5 people the Dutch version. Because of the asymmetry, that can be seen in Figure 13, it will not be possible to make valid comparisons between the different countries, and a generalisation of the results over all of the represented countries will be difficult.
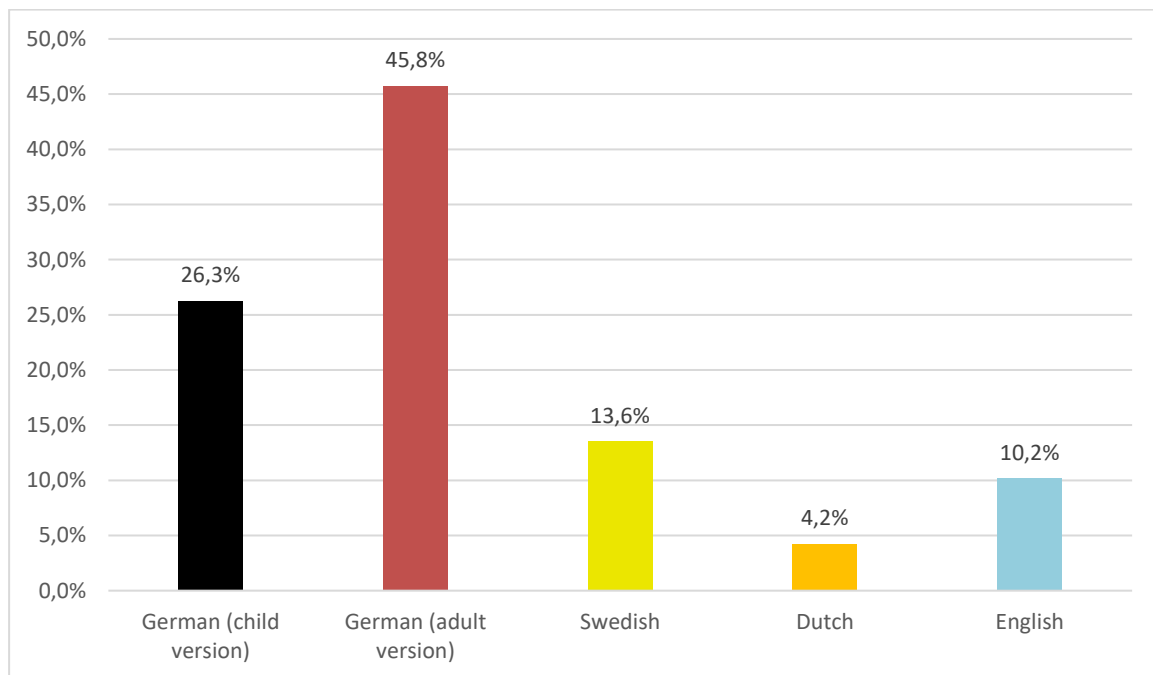
Figure 13: Distribution between the language versions

Impairment

85 participants reported that they had no impairments. 33 participants reported, they had an impairment of which 9 reported that they had multiple. The results can be seen in Figure 14.

Amount of impairments

Figure 14 shows a bar chart titled "Amount of impairments" with the following values:
- No impairment: 72,03%
- Single impairment: 20,34%
- Multiple impairments: 7,63%
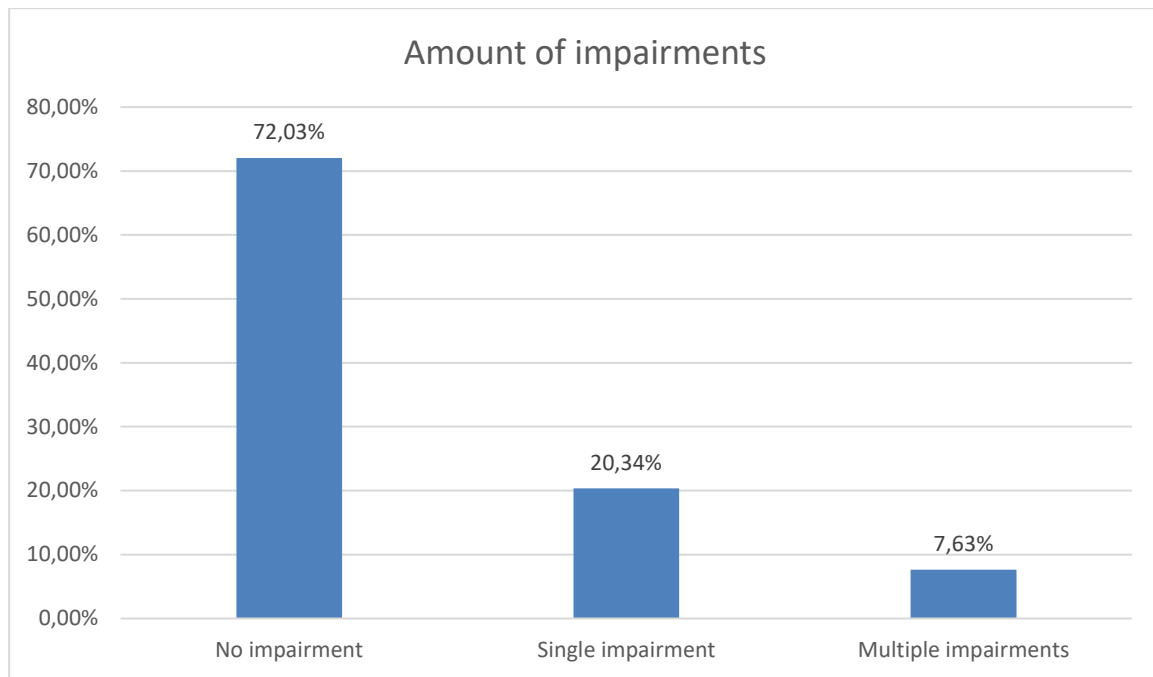
Figure 14: Number of impairments of the participants
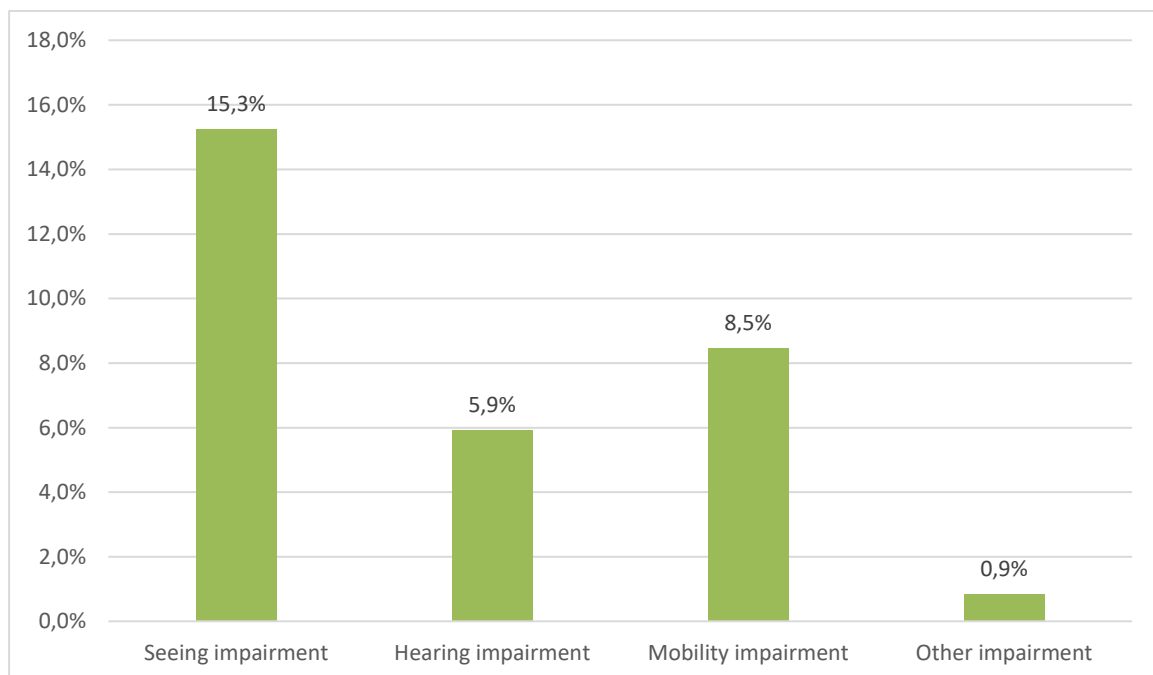
As can be seen in Figure 15, the most frequent type of impairment was seeing impairments (18 people). Seven people reported hearing impairments and 10 people mobility impairments. One person reported to have another impairment, which was Down syndrome. However, it must be added, that these answers are self-reported, which means that there is no information about the severeness of the respective impairments.

Figure 15 shows a bar chart with the following values:
- Seeing impairment: 15,3%
- Hearing impairment: 5,9%
- Mobility impairment: 8,5%
- Other impairment: 0,9%

Figure 15: Distribution of impairment types amongst the participants

Public transport use

40 participants (36,36%) use public transport at least once a week or more often. 45 (40,9%) participants use it less than once a month. This can be seen in Figure 17.
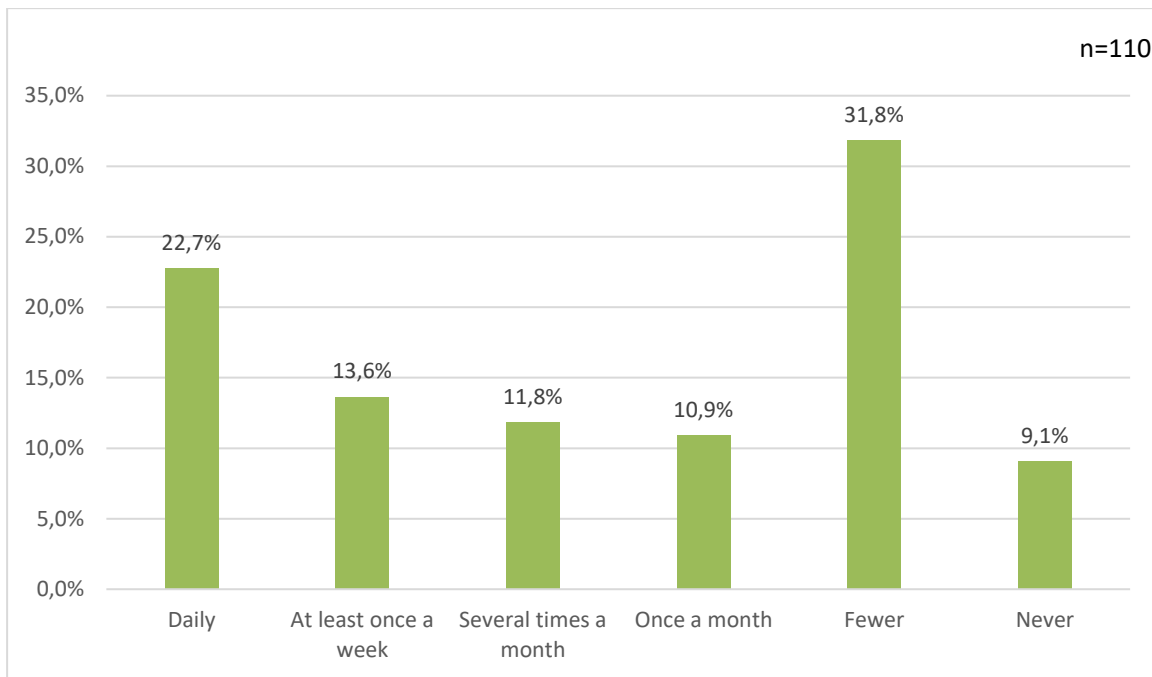
Figure 17: Frequency of public transport use of the participants

37 (31,36%) participants have had experiences with autonomous busses and rode with them before, for example as part of the field study (Figure 16).

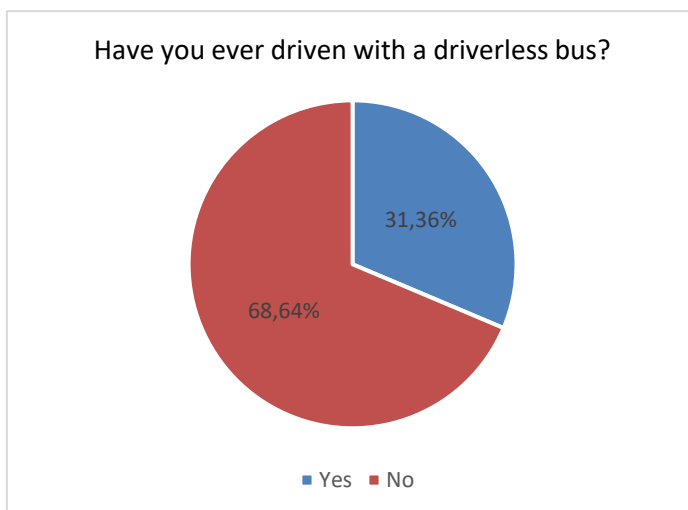**Figure 16: Past experiences with an autonomous shuttle by the participants**

Attitudes towards autonomous shuttles

Participants were asked what their feelings towards autonomous shuttles were on a scale from 1 (negative feelings) to 7 (positive feelings). The mean value here was 4.59 (n=117, sd = 1.60), so rather balanced with a small tendency to positive feelings.

In comparison to a conventional bus participants imagined a driverless bus to be slightly more punctual (m=2.75, sd=1,84), driving more frequently (m=3.42, sd=1.75), more attractive (m=2.86, sd=1.81), safer (m=2.84, sd=2.20), practical (m=2.96, sd=1.93) and cheaper (m=2.98, sd=1.91) when looking at the mean values. However, the participants think it will be driving slower (m=3.92, sd=2.54) while there will be no changes in the available space (m=3.42, sd=1.75) or the cleanliness of the vehicle (m=3.27, sd=1.93). This can be seen in Figure 18.

I think that in comparison to a conventional bus a driverless bus is...
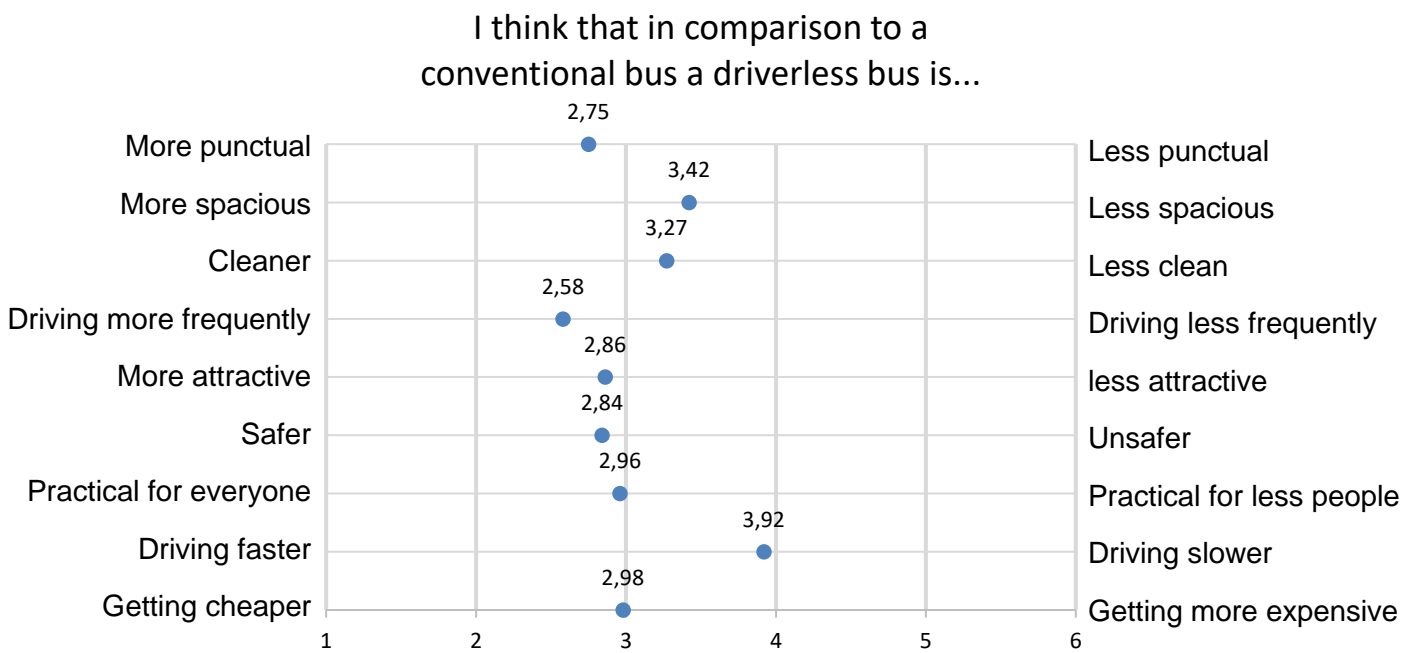
Figure 18: Participant's estimation of driverless busses in comparison to regular busses

Needs and barriers towards autonomous vehicles

The participants were confronted with different statements towards autonomous vehicles and asked to indicate how much they disagree on a scale from 1 (= I agree) to 4 (= I disagree).

1. „*I trust in the technology of self-driving busses*"

The mean score was 1.96 (n=105, sd=0.77) and additional 11 people indicated, they don't know. This score indicates that participants rather agreed to the statement and implies that they are not too concerned about the technology of self-driving busses. 16.38% of the persons disagreed or rather disagreed to the statement.

2. "*I find video surveillance on the self-driving bus necessary to make me feel secure.*"

The mean score was 1.93 (n=111, sd=0.95) while 5 participants selected that they don't know. This implies that the participants would rather have video surveillance on the bus to feel secure. 24,14% of the participants disagreed or rather disagreed with the statement.

3. "*I can imagine using a self-driving bus at night.*"

The participants rather agreed with the statement (m=2.10, sd=1.01, n=104), implying they can imagine themselves using an autonomous shuttle at night. 12 participants selected the "I don't know" option and 34,62% did (rather) disagree to the statement.

4. "*I can imagine using a self-driving bus even if I am the only passenger.*"

Again, participants rather agreed with this statement (m=1.87, sd=1.00, n=111), finding it reasonable to use a self-driving bus all alone. 5 people indicated they didn't know.

5. "*I'm afraid that I'll be helpless in case of unpleasant situations (e.g. conflicts, being molested etc.) on a self-driving bus.*"

The mean value of this item was located in the middle of the scale (m=2.65, sd=1.04, n=110) indicating that the participants had no clear tendency towards one direction. 6 people selected the "I don't know" option.

6. "*I'm afraid I won't be able to tell if a self-driving bus stops when I want to cross the street.*"

This item showed no clear tendency towards agreement or disagreement to the statement (m=2.74, sd=1.07, n=109). 7 people indicated they didn't know.

7. "*I'm afraid that getting on and off self-driving buses will be more difficult.*"

The participants had in average no concerns that getting on and off self-driving buses will be more difficult (m=3.41, sd=0.88, n=107). 57.76% of participants completely disagreed with the statement and only 5 persons agreed with it. 9 people selected the "I don't know option".

8. "*It is important to me that I can also take larger things on the self-driving bus, such as a scooter, walker, or trolley.*"

Most participants find it important to have the possibility of taking larger items onto a self-driving bus and in average rather agreed to the statement (m=1.96, sd=1.07, n=110). 73.64% of the participants (rather) agreed to this statement and 6 people indicated, they didn't know.

9. "*It is important to me that the self-driving bus does not start to drive until I have sat down.*"

The mean of this item was 2.14 (sd=1.16, n=113) indicating that participants rather agreed to the statement. This implies that the participants find it important for a self-driving bus to wait with the departure until everyone has sat down. Only 3 persons choose the "I don't know option".

10. "*I believe that the self-driving buses will make it easier for children and the elderly to travel.*"

The mean value of this item (m=2.13, sd=1.05, n=105) indicates that the participants are rather optimistic that self-driving buses will make it easier for children and elderly to travel. 11 people indicated they didn't know.

11. "*If tickets for the self-driving bus can only be purchased online, I won't be able to use it.*"

56.88% of the participants completely disagreed with that statement, while the mean value was 3.10 (sd=1.18, n=109), indicating that most of the participants are rather optimistic that they will be able to buy the tickets for the self-driving bus online. 7 people indicated that they don't know.

12. "*I'm afraid that on a self-driving bus I won't get any help when I need it.*"

The mean value of this item is located on the middle of the scale (m=2.68, sd=1.05, n=111) and the selected options are broadly distributed, implying that the participants rather disagreed on that question. 5 participants choose the "I don't know option".

13. "*It is important to me that there will be training on the use of self-driving buses.*"

Participants rather agreed to that statement (m=2.15, sd=1.15, n =112), implying that they think it is important to get some training on how to use autonomous buses, when they are introduced. 4 people indicated that they didn't know.

14. "*I would like to have a say in whether self-driving buses should be on the road.*"

The participants had no clear opinion towards this item (m=2.33, sd=1.21, n=105) and the answers diverged: 33.33% completely agreed, while 27.62% completely disagreed. 11 participants chose the "I don't know" option.

Statistical differences between different groups

Wilcoxon rank sum tests were applied in order to find differences in the agreement to the former statements. Differences were tested for age groups (children vs. elderly), impairment status (yes vs. no) and gender (male vs. female).

Differences between elderly and children

For item 2 the Wilcoxon rank sum test showed that there was a significant difference (p < .001, effect size r = -.48) between elderly (m=1.53) and children (m=2.43) indicating that elderly agreed more to the statement, that video surveillance is necessary to feel secure.

The test showed a significant difference (p = .012, effect size r = -.26) for item 9, indicating that elderly (m=1.67) agreed more to the statement, that it is important to them for the bus to wait until they have sat down, than children (m=2.32).

There was a significant difference (p = .001, effect size r = -.34) for item 13, indicating that it is more important for elderly (m= 1.72) than for children (m=2.5) to get training on the use of self-driving buses.

Differences between impairments and no impairments

The test was significant (p = .011, effect size r = -.22) for item 9 indicating that it is more important for people with impairments (m=1.71) that the self-driving bus does not start until they have sat down compared to people without impairments (m=2.3). However, the effect size was rather low.

For item 11 there was a significant difference (p = .031, effect size r = -.18) in a way that persons with impairments (m=2.73) agreed more to the statement that they won't be able to use a driverless bus when tickets can only be bought online than people without impairments (m=3.24). However, the effect size was very low.

There was a significant difference (p = .019, effect size r = -.27) again for item 13, indicating that it is more important for people with impairments (m= 1.77) to get training on the use of self-driving buses than for people without impairments (m=2.3).

Differences between gender

The test was significant (p < .001, effect size r = -.43) for item 3, indicating that women (m=2.74) agreed less than men (1.79) to the statement that they could imagine using a self-driving bus at night.

There was a significant difference (p < .001, effect size r = -.30) for item 4 showing that women (m=2.33) agreed less to the statement that they can imagine using a bus shuttle alone at night than men (m=1.62)

For item 5 there was a significant difference (p = .012, effect size r = -.22) between men (m=2.84) and women (m=2.33) indicating that women agree more to the statement, that they'd be helpless in unpleasant situations. However, the effect size is rather small.

The test was again significant for item 12 (p =.003, effect size r = -.26), indicating that women agreed more to the statement (m=2.26), that they are afraid, that they won't get any help on a self-driving bus, than men (m=2.9).

There was also a significant difference (p =.021, effect size r = -0.19) for item 13, indicating that women (m=1.8) agreed more to the statement that it is important to get training on the use of autonomous busses, than men (m=2.35). However, the effect size was very low.

Remarks by participants

There were different kinds of remarks of the participants at the end of the survey. They were grouped into different thematic fields.

Vulnerable road users

There were contrary opinions what the effect the introduction of autonomous busses will have on vulnerable road users. One participant remarked that it won't make a difference for elderly passengers: Either they are helped by the busdriver, or other passengers. Another participant worried that the focus of autonomous vehicles will not be on the safety and feeling of safety of vulnerable road users, especially old pedestrians. The participant fears that the system will be very offensive in disfavour of elderly participants.

Introduction of autonomous shuttles

One participant wished for accompanied test drives with an introduction to the shuttle in order to get used to them.

Surveillance

The need for surveillance of the bus was mentioned by two persons. The first person remarked that when children take the autonomous shuttle, there needs to be a responsible person present physically. This person should oversee the kids regarding fights and bullying. The second participant thinks that without surveillance passengers will feel the freedom for vandalism, insults, sexual harassment, and robbing.

Technology

There were many remarks regarding the technology of the autonomous busses. Some participants would like to have more information on the technology of the busses. Others do not think the technology is ready for application yet. One person noted that the few experiments with self-driving buses have all shown disappointing results. A few participants remarked that the busses need to drive calmer and have less malfunctions.

Potential

Some participants see great potential in autonomous busses. They could be used for short routes, last mile, or inside a university campus. Some participants reported about their good experiences with the bus.

Safety

One person remarked that the question of travelling alone in the bus very much depends on the location. For example, the participant would feel safe being alone in a bus in Sweden but not in Belgium.

Concerns

Participants expressed many concerns. One fear was that there will be too many providers and vehicles tacking up too much space and crowding the streets. Another remark was that autonomous vehicles will not make traffic more sustainable. Other concerns were towards privacy and security, as well as a loss of jobs.

Threat to active forms of mobility

Two participants were concerned that the introduction of driverless busses constitutes a threat to active forms of mobility. On one hand a threat to the safety of pedestrians and cyclists and on the other hand a disadvantage of traffic and space.

Ticketing

One participant wished that driverless bus shuttles can be booked like Taxis via an application on the smartphone.

Conclusion

The major conclusion of the interviews and questionnaires with the elderly people, children and persons with impairments is, that inclusive automated mobility cannot only focus on the vehicle itself but must consider all aspects of a journey. This includes ticketing, bus stops, surrounding infrastructure, information management and a lot more. One of the main issues that was raised during the interviews was the question of responsibility: People want to have a person that is responsible for ensuring their own safety or the safety of others (e.g. children). For the target-groups in this project information is key: Whether it's the departure time, the bus stops that are next or on the route, the bus number, connecting vehicles or information about the behaviour of the autonomous bus. This information must be visible and positioned in a way for all types of passengers to have a good look at.

Furthermore, we found that children and elderly differ in some of their needs and requirements. Elderly persons mainly require non-digital and offline types of information and tickets. For this group physical accessibility and comfort is more important than for children. They wish for more personal contact in every stage of public transport usage and have a high need for safety.

Children have partially different needs towards autonomous vehicles: The process of getting on and off the bus must become easier and there need to be more possibilities for children to stand securely and hold on. Children need more factors that make them feel safe using public transport and they long for better air quality in vehicles and generally more entertainment.

Many of the participants in this study think that an implementation phase for autonomous vehicles will be crucial. We recommend a slow and soft implementation phase that allows people to get used to these busses and receive training on the usage of these buses.

The interviews with stakeholders from different domains showed conflicts of interest in the implementation of autonomous busses that could lead to a disadvantage of elderly, children and persons with impairments. These conflicts could arise from business concerns, infrastructural circumstances or a balancing of interests of different passenger groups.

Additionally, many participants did not see an "added value" for themselves through the bus itself (with the exception of traffic safety in some cases). But they could imagine added value through the services the buses can provide. The survey also showed that the target-groups

are rather optimistic towards the implementation of autonomous buses, but have a need for information and safety.

One limitation of the results is that many of the stated needs are not directed specifically towards autonomous busses but are needs related towards public transport in general. However, this also shows, that there are still today many barriers for elderly, children and persons with impairments in public transport. The introduction of autonomous shuttles will not make these barriers disappear automatically.

In order to generate benefit for our target groups, autonomous shuttles must overcome the barriers for elderly, children and persons with impairments in today's public transport and at the same time offer possibilities that go beyond public transport today.

ANNEX

ANNEX I: Interview guideline with senior citizens in the qualitative interviews

Interview guideline for older people for Interviews in Seestadt Aspern

- Welcoming the participants
- Information about the CATAPULT project

	= Optional question

Mobility behaviour
Which mode of transport do you usually use? Why? For which purpose?
How do you prefer to travel?
General public transport use
How pleasant do you find it to walk or take ride the bicycle? What do you find unpleasant? What bothers? What is missing?
How easy do you find it to use public transport to travel? What is an obstacle for you? What do you find difficult when it comes to public transport? What are you uncomfortable with? What bothers? What is missing?
What do you like when using public transport?
Is there anything where you need help with when using public transport?
How satisfied / dissatisfied are you with how your living environment is connected to public transport?
Have you already used sharing offers? Why (not)?
Information / Tickets
If you travel by public transport to a place in the city where you never been before, how do you orientate yourself? What helps you?
Do you know where to find information about the timetable at the stop?

Do you sometimes check the timetable to see when the next vehicle is departing?
How easy is it for you to read the timetable?
If more than one public transport line is departing at one stop, how do you know which one vehicle to take?
How or where do you buy your ticket for public transport? How easy is it to buy a ticket for public transport?
Bus stop
How do you usually get to the stop in your neighbourhoodt?
Is the way to the stop far?
Is it easy to get to this stop? Is it easy to cross the road at the stop? Do you know of any stops where this is more problematic?
What do you find dangerous or unpleasant on the way to the stops? If nothing is unpleasant: Do you know stops where the way to the stop is unpleasant?
Is there anything on the way to the stop that gives you the feeling of security/insecurity?
How pleasant do you find the stop at the moment? - is there weather protection? - is there (sufficient) seating? - is it clean? - is a lot broken?
What should there be to make waiting more pleasant?
How do you find changing from one public transport to another? What could be simpler about it?
Is there anything at the stops to lock scooters or bikes?
Buses
How easy is it for you to get on or off buses?
Have you already tried buses with ramp / used the ramp?
Is standing on the bus easy for you? Is there enough space on the bus usually? (e.g. to store luggage)
What makes you feel safe / unsafe on the bus?

How pleasant do you find the buses at the moment? In terms of...

- Seats
- Cleanliness/smell?
- destruction?

How dose the riding on the bus feel like?

- Jerky?
- fast?
- ...

What about it is pleasant, what is unpleasant?

Interaction / consideration

Have you ever needed help during a bus ride/ at a stop?

If not, would you receive help if you need help?

Do you have the feeling that others are considerate of you in public transport or at the bus stop?

Show the video of the autonomous shuttle

Explain:

- Currently different buses are being planned and tested that drive all by themselves using sensors
- There will be no bus driver in these buses anymore
- There will still be an emergency button but no other contact person
- Otherwise, everything is still in planning and can be co-designed

Autonomous Shuttles

How did you like the ride on the driverless bus?

- What did you like?
- What not?

Were you afraid? If so, before what?

What do you think will be different in the future when driving driverless vehicles compared to today's buses?

Is there anything you're looking forward to with autonomous vehicles? Do you see any advantages? Do you see disadvantages?

What do you think will happen, if

- there is a dispute on the bus?
- an accident happened?
- ...

Could you imagine using an autonomous shuttle in the future? If not, what's stopping

you?
Do you think autonomous buses will make it easier to travel? If not, why not?
Imagine that you can determine what the stop of an autonomously driving bus will look like in the future, what should it contain?
Imagine that you can determine how an autonomously driving bus is equipped on the inside, what does the bus look like?

<u>End</u>

Imagine the route from your home to here (Hannah-Arendt-Park). What barriers did you experience along the way? What would this route and the conditions look like in an optimal future for you?

Thank you for participating and your time!

ANNEX II: Demographics and mobility behaviour questionnaire

Questionnaire

Date:_____

Participant number:_____

Age:_____

Gender: □ male   □ female   □ other

In which neighborhood do you live?

_____

Which means of transport do you mainly use in your everyday life?

□ Public transport

□ Bicycle

□ Walking

□ Car

□ Other: _____

How often do you travel by public transport?

□ (Almost) daily

□ Several times a week

□ Several times a month

□ Rarer

□ Never

What routes do you travel by public transport?

□ Work commute

□ Shopping

□ Visits from friends and relatives

□ Leisure activities (sports, culture, hobbies, etc.)

□ Tasks of daily life (doctor, post, etc.)

ANNEX III: Interview guidelines with children

Group 1: What's it like to walk?

- Do you like to walk?
- Do you walk a lot?
- Where are you going?
- How do you like the paths?
- What have you experienced while walking already pleasant or unpleasant?
- Do you have to walk across a street?
- Is that difficult?
- Are there things along the way that you like?
- Do you think there are a lot of cars driving here?
- Do you know places where more cars drive?
- Do you know the way to a bus/tram/subway stop?
- Can you find the way to the stop alone?
- How do you know where to go?
- Do you find the way to the stop far/too far
- How do other pedestrians treat you?

Group 2: At the bus stop

- Can you sit down
- Do you have enough space to sit down?
- Is there anything when it rains?
- Do you feel safe?
- What have you already experienced pleasant or unpleasant at the bus stop?
- How do you find the other people waiting at the bus stop? Is that unpleasant or do you like it?
- Is it clean at the stop?
- Is it loud at the bus stop?
- With the scooter/bike > Can you lock your scooter or bike at the stop?
- How do you know when the next bus is coming?
- Is it important for you to know?
- How do you know if it's the right bus?
- Do you get help when you need help? By whom?
- What's the wait like for you?

Group 3: On the bus

- Do you use buses/trams/subways
- Where do you go with buses/trams/subways?
- With the scooter /bike > Can you take your scooter on the bus?
- How pleasant do you find the buses?
    - cleanliness
    - smell
    - Is much broken
    - Is it too crowded?

- o Do you get a seat?
- o If you have to stand, how well can you hold on?
- o Do you find it pleasant/or unpleasant to travel by bus
  - Is the bus jerky/fast?
- Do you know at which stop you have to get off?
- How do you know?
- Do you sometimes want help driving the bus? (Are there sometimes situations that are difficult)
- Who do you want help from?
- Who have you gotten help from?
- Have you already experienced pleasant or unpleasant experiences around bus
- What do you think about getting in and out? Is that difficult for you?

ANNEX IV: Questions for the 1,2, or 3 game

[123] How did you get to school today?

- On foot/scooter/bike
- Public transport
- car

[123] How do you like getting to school?

- On foot/scooter/bike
- Public transport
- car

[123] Are you allowed to travel without adults?

- yes
- no
- No, but I wish I was

[123] Have you ever ridden alone on a bus, tram or subway?

- yes
- no
- No, but I wish I could

[Direct question] To those who drove alone before: Have you ever needed help with this? With what? Did you get the help? Did you only use one mode of transport? Have you ever switched? What was that like?

[123] Have you ever looked at a bus timetable when the next bus is coming?

- yes
- no
- I don't know what a bus timetable is

[Barometer] Do you like to ride buses, trams, or subways?

[Direct question] What do you like about it?

[Direct question] What do you not like about it?

[123] What is a driverless bus?

- A bus that runs by itself without a bus driver
- A bus that runs without passengers
- A bus that can't drive

[123] Have you already taken the driverless bus in Seestadt?

- yes
- no
- I don't know

ANNEX V

Questions/agenda items for the discussion - Department of Mobility and Public Works

Subject: Self-driving shuttles

- How do self-driving shuttles fit into Flanders' mobility policy?

- For which type of trips (distance, number of passengers, fixed vs flexible routes, on demand vs permanent, …) do you think self-driving shuttles can be most easily deployed? (some examples: On demand point-to-point service, First/last mile feeder, car-sharing, robo-taxis, Bus rapid transit)

> Which criteria are important to you when introducing self-driving shuttles?

> In what way can self-driving shuttles have the most impact on the current mobility system? What is the influence of self-driving shuttles on the environment?

- What do you think are the main barriers to the introduction of self-driving shuttles in urban areas and how can they be solved?

> Where are the 'dangers' in the introduction of self-driving shuttles?

- When do you think self-driving shuttles can be used on public roads? Which stakeholders play an important role in this?

> How do you see the evolution?

- Are there any experiences with pilot projects in which MOW is involved or is it aware?

Subject: User group (children, elderly, people with impairments)

- Which (infrastructure) adjustments are necessary/possible to deploy self-driving shuttles for vulnerable road users in busy traffic environments?

- When do you see the feasibility of deploying self-driving shuttles to help vulnerable road users (who cannot cycle or drive themselves) to overcome barriers such as crossing Henautlaan?

- Which barriers can be solved in the short (less than 5 years), medium (5-10 years) long (> 10 years) long term?

- Do you have any recommendations for formulating scenarios for this target group?

- Do you think people (and more specifically people from our target group) are open to self-driving vehicles?

> How can people be convinced? Use cases and/or benefits that can convince people to use shuttles?

Subject: North of Brussels

- What is your role in opening up the North of Brussels?

- How is the transport network organized in the North of Brussels?

- Where do you think that the North of Brussels offers the most opportunities for introducing self-driving shuttles in Brussels without many obstacles (and with the most impact)?

CATAPULT

ANNEX VI: Quantitative survey

Choose one answer: I am ◯ male ◯ female ◯ other

I have a:

◯ Visual impairment ◯ Hearing impairment ◯ Walking impairment

◯ Other impairment:_____ ◯ No impairment

Age: I am _____ years old.

How often do you travel with public transport?

daily	At least once a week	Several times a month	Once a month	fewer	never
☐	☐	☐	☐	☐	☐

Did you ever drive with a driverless bus (= a bus without a driver)?

☐ Yes ☐ No

When you think about driverless busses, do you have positive or negative feelings?

Negative feelings   Neutral   Positive feelings

☐   ☐   ☐   ☐   ☐   ☐   ☐

CATAPULT

Please indicate how much you agree or disagree to the following statements by ticking the boxes.

	I agree	I rather agree	I rather disagree	I disagree	I don't know
I trust in the technology of driverless busses.					
I find video surveillance on the driverless bus necessary to make me feel secure.					
I can imagine using a driverless bus at night.					
I can imagine using a driverless bus even if there is no one else on the bus.					
I am afraid that I'll be helpless in case of unpleasant situations (e.g. conflicts, being molested etc.) in a driverless bus.					
I'm afraid I won't be able to tell if a driverless bus stops when I want to cross the street.					
I'm afraid that getting on and off driverless buses will be more difficult.					
It is important to me that I can also take larger things on the driverless bus, such as a scooter, walker, or trolley.					
It is important to me that the driverless bus does not start until I have sat down.					
I believe that driverless buses will make it easier for children and the elderly to travel.					
If tickets for the driverless bus can only be purchased online, I can't use it.					
I'm afraid that in a driverless bus, I won't get any help when I need it.					
It is important to me that there will be training in the use of driverless buses.					
I would like to have a say in whether driverless buses should be on the road.					

CATAPULT

I think that in comparison to a conventional bus a driverless bus is…

More punctual	□	□	□	□	□	□	Less punctual
More spacious	□	□	□	□	□	□	Less spacious
Cleaner	□	□	□	□	□	□	Less clean
Driving more frequently	□	□	□	□	□	□	Driving less frequently
More attractive	□	□	□	□	□	□	Less attractive
Safer	□	□	□	□	□	□	Unsafer
Practical for everyone	□	□	□	□	□	□	Practical for less people
Driving faster	□	□	□	□	□	□	Driving slower
Getting cheaper	□	□	□	□	□	□	Getting more expensive

Is there something else you would like to tell us?