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APPENDIX 1: FACTS

Facts that supports the choice to go for self-driving cars:

1. Through our life we spend 38.000 hours behind a steering wheel or in an automobile
2. 93% of the 1.2 million number of death world wide due to road accidents are caused by human error. This total cost worldwide is 1.2 trillion due to medical, property damage and productivity
3.reduce time looking for parking place
4. double the current automotive market value
5. 99% of car brands consumer technology companies as a catalyst of innovation
6. Americans sit around 50 minutes a day in a vehicle driving
7. reduce CO2 emissions by 300 million tons per year
8. Introduce higher speed limits and make cars more versatile
9. Self-driving cars will reduce traffic congestion

Facts that supports the choice to focus on seats:

1. currently the average riders in any car ride around the world is less than two, somewhere closer to 1.4
2. In a lot of cases, people misadjust their seat, which could create significant long-term discomfort and even injuries according to Faurecia
3. Seats typically contribute 6% of the car's mass
4. J.D. Power 2017 Seat Quality and Satisfaction Study clearly provides convincing evidence that there is an inverse relationship between consumer satisfaction and the number of reported seat problems per 100 vehicles. Among the market segments examined, not surprisingly, luxury cars and luxury SUV have the lowest number of reported seat problems, and mass market midsize cars and large SUV have the most problems in seat design.
5. eighty percent of the time, the rear seats aren't in use according to Hendriks, Yan Feng Interior designer.

Facts that explain the needs of the future users (PwC report):

1.Auto tech intenders have a common mindset, referred to as 'enthusiasts' which make them the early adapters (so not necessarily age-linked).
2.Automotive technology with the clearest practical benefits have the broadest appeal.
3.More consumers are interested in ride sharing than have so far adopted it.
4.A 'personal autonomous vehicle' may currently be a consumer's preferred transportation solution.
5.Consumers mentioned a partnership between automotive and technology brands as being an ideal auto tech offering. 61% wants to see an integration between the car and their smartphone.
6.our cars may soon be seen as travelling computer or entertainment centers, embedded with a myriad of sensors and communication devices that transmit all manner of information to and from our homes, our phones and our other personal devices.
7.Currently, consumers are concerned with comprehensive vehicle tracking (74%), remote vehicle shutdown (68%) and driver override system (67%)
8.More people are familiar with ride sharing (88%) vs car sharing (70%). More people want to try ride sharing vs. car sharing
9.72% say they would never rent their car to a stranger
10.Nearly all (95%) have heard of one of the terms used to describe an autonomous vehicle. Mostly self-driving cars.
11.66% tells that they are interested in trying an autonomous vehicle, because this technology will make it drive better than the average driver.
12.Safety is the major concern for the consumer. More than 53% say they are scared of self-driving cars: 54% say that autonomous cars are dangerous and 28% say autonomous vehicles are susceptible to hacking.
13.According to consumers, the biggest advantages of an autonomous vehicle are:
- better transportation for elderly (41%)
- it will be easier to take longer car trips (34%)
- fewer accidents (28%)
- more enjoyable travel in my vehicle (28%)
- ability to be more productive in my car (25%)

Audi's 25th hour project facts:

1. A surrounding without distractions- blacked out windows, optimized lights and no messages, create a surrounding in which people can relax most and fulfill their task best.
2. There are desired modes of spending time: productive time for work, quality time with family and friends or down time which is defined by watching movies or playing a game.
3. Future car interior: very clean, digital and networked
4. Audi sees in-car-advertising as inevitable, so what may be the most elegant way of integrating them. (people find ads annoying).
5.The space within felt more like a space which was designed for interpersonal communication that is more a future living room than a future smartphone.

Facts about safety:

1.With current technology it is not possible to let users rotate for 90 degrees because of the lack of airbags in those positions in case of a crash
2.School buses don't have seatbelts because of compartmentalization. The rear of each seat is higher and of soft padding that functions as an airbag in case of a crash plus generally, occupants sit higher than the crash height which also helps.

Facts about seat adjustments:

1.According to Ford, the main reason to change the seat position is vision, comfort, handling, safety and style.
2.According to Ford, occupants do not desire to have the seat adjustment buttons on the seat but instead, external.

APPENDIX2: TRENDS

Demographical trends

1.The UN predicts that by 2030, approximately 70% of the world population, 4.9 billion people, will be living in urban areas. It is expected that this rise of megacities will have major effects on urbanite mobility and housing patterns.
2.In 2030, most of developed countries are expected to be hyper-aging society of which ratio of 65 years old or older is 21% or more due to low birth rate and a rapidly aging population. Because of this, future mobility will take dynamic value of the elderly such as health, healing and communication into account.
3.From a detailed analysis it becomes clear that dense areas with a large, established vehicle base are best fit for new mobility services i.e. cities and suburbs of Europe and North America fit this profile.

Economical trends

1.Advances in networking technologies have reduced the cost of sharing, lowering the bar for a "sharing economy" and accelerating its adoption. This new sharing economy, valuing economic rationality rather than social status, has started to enter the mainstream; goods are valued on their stories, experiences, and other intangible values in this new shared society.
2.The annual growth rate of car sales will drop from 3.6 percent to around 2 percent by 2030. This drop will be largely driven by car sharing and e-hailing. It is expected that up to one out of ten new cars sold in 2030 may likely be a shared vehicle.
3.In 2030, the share of electrified vehicles could range from 10 percent to 50 percent of new-vehicle sales.

Political trends

1. The national Safety Council in the U.S. aims to reduce traffic related fatalities to zero by 2050

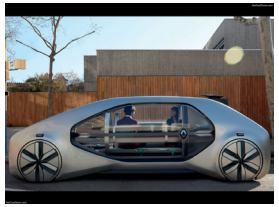
Environmental trends

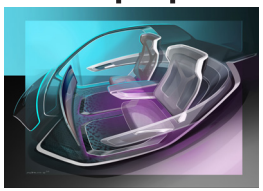
Social-cultural trends

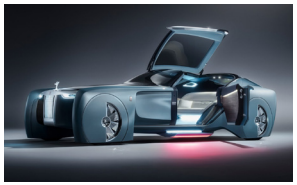
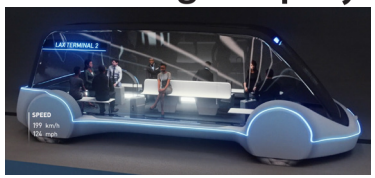
1.Societal anxiety and chaos are being driven by unrelenting technological evolution, causing such as cyber terrorism/crime, class polarization, techno-stress, and generational conflict to sharply increase. In light of these pressures, consumers will demand spaces and experiences that empathize and alleviate their anxieties. Mobility as a healing medium will become more important, no longer will it be simply a means of transport; it's special value will drastically increase
2.Car brands like Porsche, Volvo, BMW, Hyundai and Cadillac start to offer a 'car subscription program' which let users have the flexibility to swap cars within the brand whenever they want for a certain price.
3.Consumer's new habit of using tailored solutions for each purpose will lead to new segments of specialize vehicles designed for very specific needs (like commuting alone to work or taking the whole family to the beach)
4.The importance of private-car ownership is declining: in the United States, for example, the share of young people (16 to 24 years) who hold a driver's license dropped from 76 percent in 2000 to 71 percent in 2013, while there has been over 30 percent annual growth in car-sharing members in North America and Germany over the last five years.
5.The product development and launch cycles of cars have shortened (68% have a go-to-market under two years) in order to meet the customers/users demand and advances in technology.

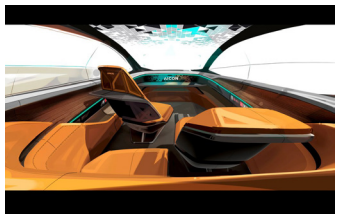
Technological trends

1.Parts of the car interior will have multiple purposes like smart windscreens that feature augmented reality systems and provide information about real-time traffic and weather forecasts.
2.It is expected that by 2020, 90 percent of new cars will be connected to the internet, which will create a demand for new consumer services and applications. Examples are that paying for electricity will be done through the cloud, occupants could be made aware of local restaurants an attraction they might want to visit in a new district.
3.Artificial Intelligence will be used more to anticipate occupants needs, inspire their imaginations and improve their lives. In the future, the vehicle learns with the driver to build a relationship that is meaningful and human. Furthermore, the AI can for example greet passengers, scan personal condition of occupant, mimic their driving by deep learning or measure emotions that are mapped against where and when the driver is.
4.By 2023, all new cars could have V2V connection. This is a connection between vehicles in which basic data like speed, brake status, and heading is shared in order to make vehicles adapt to each other better.
5.Later, V2X will be introduced. This is a communication system between vehicles and all around them (like traffic lights and smartphones of people on the street or bike) which ensures a safer world.
6.Shared mobility solutions with shorter life cycles will become more common, making consumers constantly aware of technological advances, which will further increase demand for upgradability of their cars.
7.Removable trim covers are another feature that could become more common and used during car/ride sharing. It could become personal and easy to change for the occupants to fit their needs.
8.Use of sensors to learn more about the occupant's body size and shape and by looking at biometrics and vital signs it can be recognized if occupants are drowsy or stressed -> adapt system to it.
9.More effort is put into massage systems now

Brand	level of autonomy	characteristics	in-and egress	Expected date	trends	Interior positions
Rinspeed Snap 	level 4	a fusion of a skateboard and a pod which functions as a third living space. The pod can be leased, owned or shared while the skateboard serves everyone 24/7	Sliding doors	2021	A smart city where everything is connected and autonomous	Seating position featuring four lounge chairs in a face-to-face layout with displays in-between
Volkswagen Sedric 	Level 5	A self-driving taxi in which mobility for all (think of children, physically-challenged people, visually impaired people and elderly) is provided. The idea is that the taxi can take them from wherever they are to any location while the occupants can spend their time to read, learn, sleep or just enjoy the environment	Sliding doors	2021	Focused on the trend that people perceive cars as their second home. In this case, a home for everyone, thus different interior designs	communication-oriented seating position featuring four lounge chairs in a face-to-face layout
Mercedes F015 	Level 4 autonomy, with driving as a mere extra when people want to drive it	The car is treated as a private retreat where occupants can relax or work. The car is like a digital living space where there is a symbiosis of the virtual and real world. “The car is growing beyond its role as a mere means of transport and will ultimately become a mobile living space.”	Suicide doors	City of the future 2030+.	Urban space is scarcer than ever, people have a growing desire for privacy and a place to retreat to.	communication-oriented seating position featuring four lounge chairs in a face-to-face layout while driving possibilities are added (180 degrees swivel for drivers seat)
Renault EZ-GO 	Level 4 autonomy	The vehicle focusses on use within the city and can be seen as a taxi or bus. EZ-Go was designed with individuals or small groups in mind (aging or very young population, with people looking for new mobile solutions). The characteristics of EZ-GO make it possible to change usage and user scenarios, keeping with the "Easy Life" approach which is at the heart of Renault’s DNA	Hatch-door front entrance	Release is aimed at 2022	Integrate into the environment and maximize new ways of moving around in a congested smart city where the vehicle is connected	The seats are faced in a U-shape, so occupants can all face each other and make the ride more social

Brand	level of autonomy	characteristics	in-and egress	Expected date	trends	Interior positions
Aston Martin Lagonda vision 	Level 4 autonomy, with driving as a mere extra when people want to drive it	A throughout modern, emission-free form of super-luxurious vehicle to provide luxury transport	Suicidal doors with hatch on top	2021-2023	Focusing on new forms of luxury materials, instead of the traditional leather and total relaxation	The seats are originally still in driving position but can be turned 180 degrees when occupants wants to be face-to-face
Icona Nucleus 	n/a	Futurism and human-centered mindset. Has sofa's that empower relaxation but also a table and lamps that focus on working. Occupants feel like they are in a luxurious living room	1 big sliding door with hatch on top	n/a	Focusing on the trend that the car is someones second living room	The seats are uniquely set and are rotatable in case of leisure or work
Audi Pop.Up Next 	n/a	A concept which combines moving autonomously vertically and horizontally. It exists of a skateboard, pod and propellers by which it can drive or fly	n/a	n/a	Focusses on the trend that people desire total freedom in these days that everything seems so busy	Two seats focused to front with a 49-inch screen That follows the eye of the viewer.
Volkswagen I.D. Buzz 	Level 4 autonomy, with driving as a mere extra when people want to drive it	A spacious and homely interior for when longer journeys are calling. All 8 seats can swivel and change directions. Modular floor that enables adding seats and tablets based on activity performed	Normal and slide doors	2022	Focusing on the trend of travelling together and desiring a interior that needs to be multifunctional for all occupants needs	Seats are fully modular, turn able and swivel able. Steering wheel is foldable
Volkswagen ID Vizzion 	Level 5	Minimalistic car interior for the family which emphasizes the use of smart glasses. Seats are non-configurable	Suicide doors	2025	Combines smart technology where the car knows your schedule and smart glasses which make you see stuff on the dashboard	traditional seating position without steering wheel or pedals. Car is controlled by voice

Brand	level of autonomy	characteristics	in-and egress	Expected date	trends	Interior positions
BMW vision next 100 	Level 4, with driving as a mere extra when people want to drive it	Luxurious seating option where driving is still possible and where augmented reality and 'living' seats are used	Gullwing doors	n/a	Focusing on the desire for synergy between occupants and a 'living' interior that only provide the necessary information	Traditional seating position with foldable steering wheel.
Rolls Royce 	Level 5	Maximum level of luxury, where the emphasis is on enjoying content on display and environment with a drink	Suicide with hatch	n/a	Makes use of augmented reality and focusing on the trend that people desire to enjoy special moments more	Comfy couch fixed for two occupants facing forward
The Boring Company 	Level 4	New concept by Elon Musk in which people are transported beneath the ground (by tunnels)	n/a	n/a	Makes use of the fact that cities get more congested thus new ideas are required	An open area that allows different scenarios like, entering with bike or dog or just relaxing
Adient AI 18 	Level 3/4	The seat is flexible arranged and the seatbelt and airbag system are fundamentally changed. 180 degrees changeable passenger seat. Has a lounge mode, family mode, baby plus mode, cargo mode and communication mode. Multiple parts of the interior are flexible and easy to adapt. Arm supports help when reading or using smartphone	n/a	Vision for 2030	Focused on urban performance, alternative ownership, and autonomous driving	Multiple modes described

Brand	level of autonomy	characteristics	in-and egress	Expected date	trends	Interior positions
Faurecia Byton 	Level 3	20-degree swivel function. In production in 2019. First step to introducing activities like exercising, knitting or playing the guitar in the future vehicle.	Side doors	2019	A first start in more interior freedom. Leans on digital future technology that creates a digital lounge by Gesture- and voice command	Traditional seating position
Renault Symbioz 	Level 4, with a possibility to still drive the car when desired	multi-modal interior matches the living room	Suicide doors	n/a	Focusing on the trend that the car will become a second living room and total connectivity between your home, car and infrastruture	Traditional seating position with the possibility tro swivel the front seats 180 degrees
Audi Aicon 	Level 5	A luxury living room that lets you relax while the car is doing all the work	Suicide doors	n/a	Focusing on using AI to simplify our lives and only provide the necessary information	Traditional seating position with swiveling and moveable front seats and a slide-out rear bench which allow for different layouts and high comfort
Smart Vision Eq Fortwo 	Level 5	The idea is that you want to be in your own caccoon and be driven from A to B, with the possibility to meet others, if you desire	Gullwing doors	2025	Focusing on personal pleasures and 'me' time but also to connect with others that have the same interests	Traditional seating position for two occupants

Brand	level of autonomy	characteristics	in-and egress	Expected date	trends	Interior positions
Toyota Concept i 	Level 4, with the possibility to drive it	A concept that was designed to make technology help humans	Gullwing doors	n/a	Based on synergy between driver and car by use of AI and a connection with the outer world	Traditional seating position
Yan Feng XiM18 concept 	Level 4, with a possibility to still drive the car when desired	A car that is designed for short commuting while taking 4000 users into account.	Suicide doors	2025	Focusing on ride-sharing with different users desiring different things. Recognition of users by AI technology	Multiple modes

APPENDIX4: CHARACTERISTICS

Personal vs. Public
An automotive interior is seen as personal when it provides solutions which resemble the desires of the individual occupant. Think about an AI which knows what you want and adapts the interior accordingly to it or a combination of the right seat set-up, materials, and setting.

Focus on drive experience vs. cabin experience
The automotive interior of tomorrow may focus on driving or on the cabin experience itself.

Practical vs. Non-Practical
An automotive interior is seen as practical when it fulfills its functions up to a satisfied level.

Versatile vs. Limited
An automotive interior is described as versatile when it does more than 'only supporting' the occupant during seating. Examples are like additional room for luggage, massage capabilities, providing information to the occupant but also the ability to propose multiple modes like work mode or relaxation mode.

Humanlike vs. Nonhuman
An automotive interior of the future may become too robot-like and cause anxiety. This will result in a desire to have a more humanlike interior.

Connected vs. Disconnected
An automotive interior that is connected, is capable of getting information through the cars V2V/V2X possibilities and the cloud.

Safe vs. Unsafe
All automotive interior, in production, need to be within safety regulations but some may provide more, or at least look like being safer.

Use of high-end materials vs. Cheap looking
Materials that provide a 'premium' look. With a new interior, this does not necessarily need to be leather. It is more about what the interior provides you when you desire it. Think about materials that look premium, by the right amount of detailing and that is not sensitive to stains when having a party in the vehicle.

Multiple materials vs. Single material
The use of different materials provides a contrast within the automotive interior which can either create a nice balance or be overdesigned.

Comfort, by supporting different postures vs. Discomfort
Providing comfort in an automotive interior happens by implementing several options. One of it is the support for different postures when commuting for a long time. An extreme example is the possibility to change for seating to laying down for relaxing.

Hygienic vs. Unhygienic
An automotive interior which is easily cleanable is perceived as hygienic.

Flexibility in size & design vs. Fixed
An automotive interior is seen as flexible when it provides the user to change the interior's size and design to his likings. For example, the possibility to easily add or remove a seat or to move the interior around, while it is also easily upgradable over time or the possibility to change things like the seat cover and stiffness of cushioning.

Additional luxury
An automotive interior has the additional luxury if the main function of it is strengthened by things like lumbar support, massage systems, sensory adjustments, etc.

Complexity of production
An automotive interior could have different levels of complexity regarding production, based on the material use and connection between the parts.

APPENDIX5: SUMMARY OF LITERATURE REVIEW

1

Comfortable rear seat postures preferred by car passengers

Postures observed during different activities in trains were adapted to rear seat car passengers to find out the angles between the joints

(Kilincsoy, U., Wagner, A., Bengler, K., Bubb, H., Vink, P. 2014)

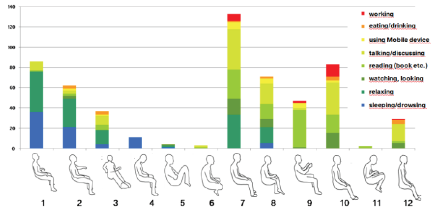


Figure 2. Research of typical activities of train passengers and the resulting postures.

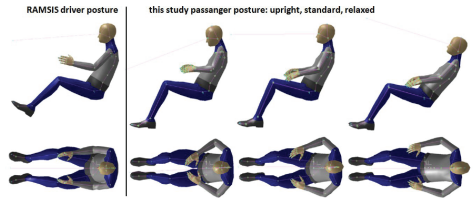


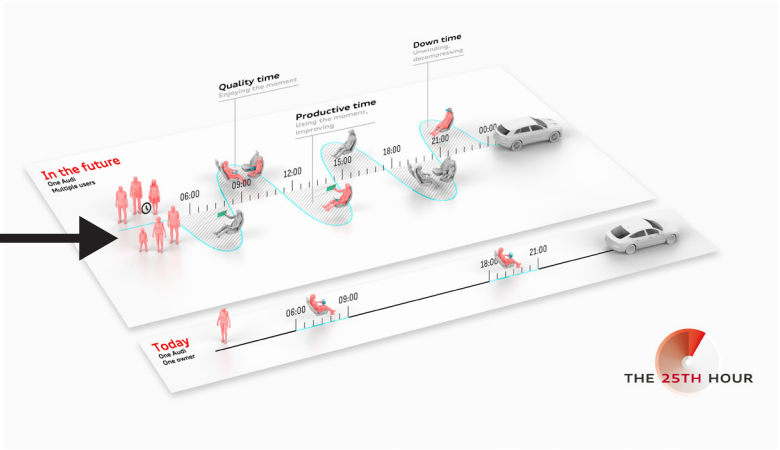
Figure 6. Visualization of the results in RAMSIS: upright posture (left), standard posture (middle), relaxed posture (right)

2

Audi's 25th hour project

Different activities were assumed during different moment of the day, while using ride sharing.

(Audi, 2018)



3

Activities, postures and comfort perception of train passengers as input for train seat design

Different activities were observed and translated into postures

(Groenesteijn, L., Hiemstra-van Mastrigt, S., Gallais, C., Blok, M., Kuijt-Evers, l., Vink, P. 2014)

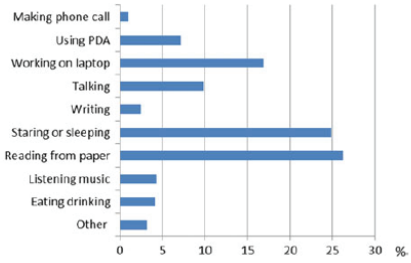


Figure 2. Distribution of activities (in percentages of total) based on frequencies of 786 short observations.

4 & 5

Use Air To

- reduce weight (compared with mechanical systems
- make comfort personal by memory systems
- Massage system
- Adapt to range difference between p5-p95
- Adapt seat unto 'ideal' shape

Fig. 1. The inflatable bladders in the seat used in experiment 1.

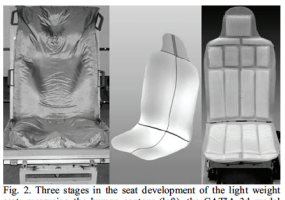


Fig. 2. Three stages in the seat development of the light weight seat: measuring the human contour (left), the CATIA 3d model (middle), the seat shell with inflatable cushions (right).

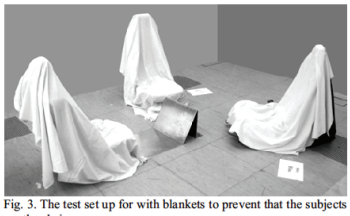
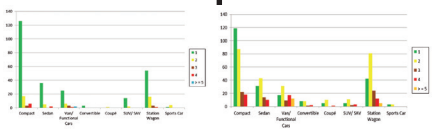


Fig. 3. The test set up for with blankets to prevent that the subjects see the chair.

6

Adaptable modulair car interior

With ride sharing, we can think of modulair car interior that is adaptable to the situation of the user, for example, alone vs. together and type of travel (commute vs vacation).



amount of people sitting in a car type while commuting or on vacation

Table 1

An extract of the most frequent objects in different driving situations: commuting, leisure, vacation, special occasion to give an overview on different use case scenarios; frequencies >5% are highlighted

	Smartphone/ mobile	Keys	Sun glasses	Umbrella (dry)	Wallet	Handbag	Laptop	Folder/ documents	Jacket/ coat	Bag, work	Sports equipment	Bottle	Luggage	Supplies	Shoes	Suits, blazer
Objects commuting	14.1%	9.2%	8.3%	5.5%	5.5%	1.6%	4.2%	4.6%	1.6%	1.2%	3.8%	0.6%	0.6%	1.6%	4.2%	
Objects commuting seldom	0.0%	0.0%	4.3%	13.9%	2.9%	0.0%	13.9%	16.5%	11.6%	3.8%	1.6%	4.3%	1.6%	0.6%	4.3%	0.0%
Objects leisure	7.2%	4.7%	5.0%	4.0%	4.3%	1.6%	6.2%	0.2%	3.0%	0.2%	14.4%	9.2%	0.7%	3.0%	4.2%	0.0%
Objects leisure seldom	0.0%	0.0%	1.6%	1.6%	0.0%	1.6%	1.6%	0.0%	4.7%	0.0%	37.5%	4.7%	3.1%	1.6%	3.1%	0.0%
Objects vacation	4.9%	2.8%	3.1%	3.0%	2.8%	2.6%	6.5%	0.2%	1.6%	0.0%	6.7%	11.2%	15.4%	10.0%	2.1%	0.2%
Objects special occasion	2.6%	1.6%	2.1%	4.8%	3.7%	3.7%	4.2%	0.0%	20.6%	0.0%	0.5%	0.3%	7.4%	0.0%	17.5%	15.9%

Objects that were used during different scenarios

Smartphones were not only stored within the **primary reach of users** like other valuables e.g. wallet or other CE devices, but also within the **primary field of vision**. This personal object was stored exclusibely upon the passenger front seat, the middle console and cup holders, but never on the floor or rear seats.

Table 2

Frequency distribution of personal objects stored on or close to seats

Seat	Maps	Jacket/ coat	Tablet PC	Bottle	Supplies	Hand-bag	Bag work	Laptop	Smart-phone/ mobile	Sports equipment	Suits	Shoes	Umbrella (wet)
Seating background	16.7%	8.3%	8.3%	0.0%	0.0%	0.0%	0.0%	8.3%	0.0%	0.0%	0.0%	0.0%	0.0%
Front seats	2.4%	4.8%	0.0%	18.3%	15.9%	15.9%	6.3%	6.3%	5.6%	0.0%	0.0%	0.0%	0.0%
Rear seats	0.0%	21.7%	0.0%	5.6%	4.2%	3.5%	4.9%	6.3%	0.0%	8.4%	5.6%	0.0%	0.0%
Under the seats	12.5%	0.0%	12.5%	0.0%	0.0%	12.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Floor front driver	0.0%	0.0%	0.0%	31.3%	12.5%	6.3%	0.0%	0.0%	0.0%	6.3%	0.0%	25.0%	18.8%
Floor front passenger	0.0%	0.0%	1.0%	23.0%	17.0%	19.0%	6.0%	2.0%	0.0%	2.0%	0.0%	9.0%	4.0%
Floor rear driver	0.0%	0.0%	0.0%	11.4%	10.0%	8.6%	14.3%	8.6%	0.0%	5.7%	0.0%	17.9%	2.9%
Floor rear passenger	0.0%	0.0%	0.0%	25.0%	21.9%	3.1%	12.5%	3.1%	0.0%	0.0%	0.0%	12.5%	3.1%

Table 3

Storage use cases of the door compartment

	Tissues	Sun glasses	Wallet	Bottle	Keys	Umbrella (dry)	Smartphone
Door compartment	10.1%	9.2%	8.3%	8.3%	7.3%	5.5%	5.5%

Table 4

Sersonal belongings stored in various spaces close to the middle console

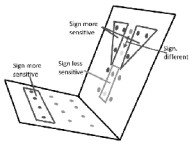
Centerconsole	Smartphone	Keys	Wallet	Sun glasses	Tissues	Glasses	Gum/mints	Supplies	Bottle
Centerconsole front	23.1%	13.1%	12.3%	9.2%	6.9%	4.6%	2.3%	0.0%	0.8%
Centerconsole middle	14.8%	9.3%	13.0%	5.6%	5.6%	9.3%	7.4%	5.6%	0.0%
Centerconsole sideways	0.0%	0.0%	11.1%	0.0%	0.0%	0.0%	0.0%	0.0%	44.4%

The places of these objects within the car

7

Sensitivity

Play with the sensitivity of the human body and use different softness of foams (or even airbladders that create different sofness) to remove discomfort. Franz did this for example by using different softness in the headrest for the neck and head

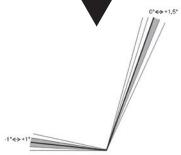


8

Dynamic comfort

Static comfort vs. dynamic comfort, so reducing physical fatigue from static seating by enabling passive posture variation by passive micro-movements (a variation in seat pan angle between -1 and +1 and a variation of backrest angle between 0 and +1.5 seemed plausible.)

Designing the seat for only a 'ideal' shape has no benefit when the interaction is longer than 40 min.



9

New headrest with neck support

Three different hardness for head and necksupport were found

Fig. 3. Headrest with neck support in different positions.

10

A Literature review of mobile devices used in ergonomic seating settings

Study shows that comfort is based on the whole interaction

Within this interaction, even stuff as smell and vibrations could play a role in measuring comfort

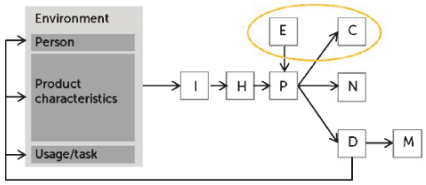


Fig. 2. The comfort model of Vink and Hallbeck [6].

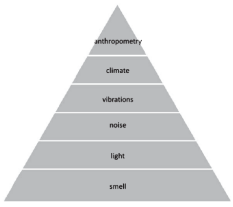


Fig. 4. The discomfort pyramid of Bubb [20].

11

Application of the ideal pressure distribution in an automotive car seat

Indepth influences of seat surface and metal structure has been made

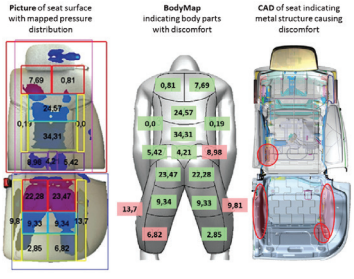


Fig. 9. Identification of pressure peaks on the seat surface and in the seat structure.

APPENDIX6: PRELIM-SURVEY

Front page prelim-survey

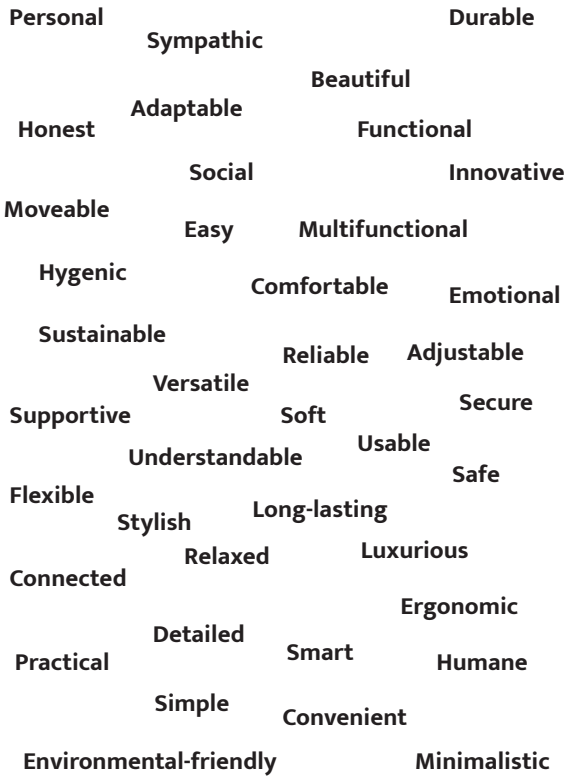
Imagine that you are sitting in a seat of an future car that drives itself. This vehicle does not have a steering wheel or pedal and does not focus on the driving experience anymore but instead, lets the occupant(s) enjoy the time they spend within the cabin as they wish.

Which attributes of the interior of this cabin is important to you as possible future user, during this scenario?

1. .....
2. .....
3. .....
4. .....
5. .....
6. .....
7. .....
8. .....

Examples: relaxation, long-lasting or honest

Rear page prelim-survey



Results data

attributes			
comfortable, ergonomic	18	hygenic	3
safe, secure, controllable	16	honest	2
pleasant, relaxation, user friendly, simple, humane, easy	12	innovative	2
multifunctional, versatile	10	moveable	2
practical, convenient	9	luxurious	1
adaptable	8	freedom	1
reliable, durable	7	connected	1
beautiful,stylish, luxurious	6	private	1
smart	6	flexible	1
social	5	minimalistic	1
environmental-friendly	5	soft	1
spacious, accesible	4	innovative	1
personal	4	detailed	1
		humane	1

Converted to statements

Statements

The seating position seems comfortable
The seating position looks safe
The seating position seems pleasant in use
The seating position is multifunctional
The seating position seems practical in the functions it proposes
The seating position is nicely adaptable to my needs
the seating positions looks reliable
The seating position looks aesthetically pleasing
The seating position has smart options that I would use
The seating position seems to value being social
The seating position gives the ability to feel disconnected from technology
The seating position respects my invididual space

APPENDIX7: ONLINE SURVEY

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Designing a seating arrangement for a self-driving car

Thanks for participating in this survey! With this survey, I've started my graduation thesis in which I will propose a ergonomic design of an interior within self-driving cars. The goal of this survey is to find out what you, as future user, will desire of this interior. It does not matter if you do not make use of a car as main transport, as long as you travel by car, train or bus so Have fun!

*Required

1. **Q1. Name (optional)**

2. **Q2. Gender** *
   Tick all that apply.
   - [ ] Male
   - [ ] Female

3. **Q3. What is your age?** *
   Mark only one oval.
   - ◯ Under 18
   - ◯ 18 - 24 years old
   - ◯ 25 - 34 years old
   - ◯ 35 - 44 years old
   - ◯ 45 - 54 years old
   - ◯ 55 - 64 years old
   - ◯ 65 or older

4. **Q4. What is your current occupation?** *
   examples are student, accountant, researcher or lawyer

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5. **Q5. What is your current household situation?** *
   Mark only one oval.
   - ◯ Single, living alone
   - ◯ Single, living with family or friends
   - ◯ Married, no children
   - ◯ Married, with one child
   - ◯ Married, with two children
   - ◯ Married, with more than two children

Statement Cards

COMMUTING means using a transportation vehicle to go from A to B. This could be a car, train or bus.

6. **Q6. Statement Cards** *
   Mark only one oval per row.

	Completely disagree	Mostly disagree	Slightly disagree	Undecided	Slightly agree	Mostly agree	Completely agree
I value personal space	◯	◯	◯	◯	◯	◯	◯
I am scared of travelling in an future self-driving car	◯	◯	◯	◯	◯	◯	◯
I often want to feel disconnected from technology	◯	◯	◯	◯	◯	◯	◯
I would value being social with strangers when using ride sharing	◯	◯	◯	◯	◯	◯	◯
I value being social with family or friends	◯	◯	◯	◯	◯	◯	◯

7. **Q7. For the following modes of travel I would like to use:** *
   Tick all that apply.

	Compact car	Sedan	Van	Convertible	Coupe	SUV	Station Wagon	Sports Car
Daily commuting	☐	☐	☐	☐	☐	☐	☐	☐
Long distance	☐	☐	☐	☐	☐	☐	☐	☐
Vacation	☐	☐	☐	☐	☐	☐	☐	☐

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8. **Q8. Currently (daily) commuting takes me approximately:** *
   Mark only one oval.
   - ◯ 0. I do not make use of any form of travelling (car, bus or train)
   - ◯ 15 - 30 minutes
   - ◯ 30 - 60 minutes
   - ◯ 60 - 90 minutes
   - ◯ more than 90 minutes

9. **Q9. When I am currently commuting, it is mostly:** *
   Mark only one oval.
   - ◯ Alone
   - ◯ With 1 person
   - ◯ With more than 1 person

10. **Q10. When I am commuting in an future self-driving car, I would like to spend my time with (multiple answers are allowed):** *
    Tick all that apply.

	With sleeping	By eating	By using my smartphone/tablet for reading or entertainment	By preparing work	By socialising with other people within the car	With entertainment within the car
Morning	☐	☐	☐	☐	☐	☐
afternoon	☐	☐	☐	☐	☐	☐
evening	☐	☐	☐	☐	☐	☐
night	☐	☐	☐	☐	☐	☐

11. **Q11. Are there any other activities which you would do while commuting in a self-driving car? (optional)**
    For example, exercise or just stare to the environment

Page 4/12

12. **Q12. How important are the following attributes in an self-driving future car?** *
    Mark only one oval per row.

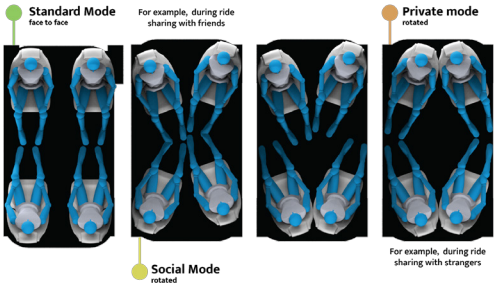
	Not important	Slightly important	Moderately Important	Important	Very important
Comfort	◯	◯	◯	◯	◯
Safety	◯	◯	◯	◯	◯
Pleasant in use	◯	◯	◯	◯	◯
Multifunctionality	◯	◯	◯	◯	◯
Practical in its functions it provides	◯	◯	◯	◯	◯

13. **Q13. In the future when I am commuting in an future self-driving car I would prefer to commute mostly:** *
    Mark only one oval.
    - ◯ Alone
    - ◯ With 1 person, preferably family or friends
    - ◯ with 1 person, possibly a stranger
    - ◯ with more than 1 person, preferably family or friends
    - ◯ With more than 1 person, possibly strangers

In this last part, I would like to know which seating arrangement you would prefer during daily commuting. All concepts have multiple modes to satisfy occupants (and use new technology which makes it possible to put airbags and safety belts into the seats) and the idea is that you score them according to the statements below. There are 4 seating concepts.

CONCEPT 1/4

Concept 1:



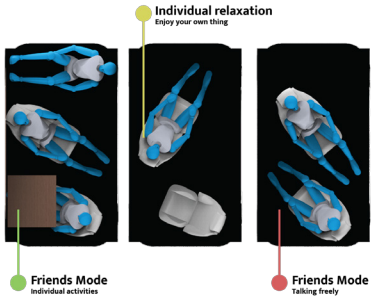
14. **Statements about concept 1:** *
Mark only one oval per row.

	Completely disagree	Mostly disagree	Slightly disagree	Undecided	Slightly agree	Mostly agree	Completely agree
The seating arrangement seems comfortable							
The seating arrangement looks safe							
The seating arrangement seems pleasant in use							
The seating arrangement is multifunctional							
The seating arrangement seems practical in the functions it proposes							
The seating arrangement is nicely adaptable to my needs							
The seating arrangement has smart options that I would use							
The seating arrangement respects my invididual space							

15. **What score would you give to the overall concept?** *
Mark only one oval.

1	2	3	4	5	6	7	8	9	10

Concept 2:



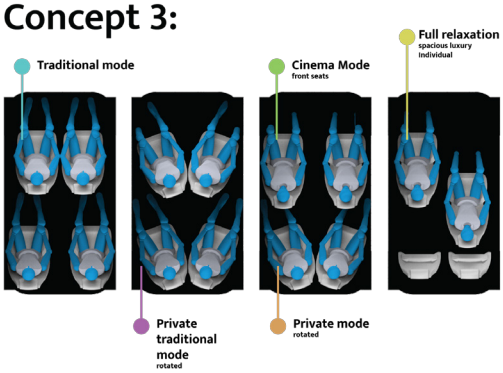
16. **Statements about concept 2:** *
Mark only one oval per row.

	Completely disagree	Mostly disagree	Slightly disagree	Undecided	Slightly agree	Mostly agree	Completely agree
The seating arrangement seems comfortable							
The seating arrangement looks safe							
The seating arrangement seems pleasant in use							
The seating arrangement is multifunctional							
The seating arrangement seems practical in the functions it proposes							
The seating arrangement is nicely adaptable to my needs							
The seating arrangement has smart options that I would use							
The seating arrangement respects my invididual space							

17. **What score would you give to the overall concept?** *
Mark only one oval.

1	2	3	4	5	6	7	8	9	10

Concept 3:



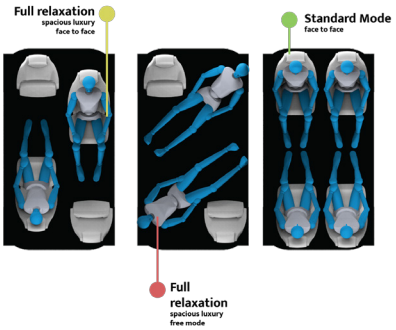
18. **Statements about concept 3:** *
Mark only one oval per row.

	Completely disagree	Mostly disagree	Slightly disagree	Undecided	Slightly agree	Mostly agree	Completely agree
The seating arrangement seems comfortable							
The seating arrangement looks safe							
The seating arrangement seems pleasant in use							
The seating arrangement is multifunctional							
The seating arrangement seems practical in the functions it proposes							
The seating arrangement is nicely adaptable to my needs							
The seating arrangement has smart options that I would use							
The seating arrangement respects my invididual space							

19. **What score would you give to the overall concept?** *
Mark only one oval.

1	2	3	4	5	6	7	8	9	10

Concept 4:



20. **Statements about concept 4:** *
Mark only one oval per row.

	Completely disagree	Mostly disagree	Slightly disagree	Undecided	Slightly agree	Mostly agree	Completely agree
The seating arrangement seems comfortable							
The seating arrangement looks safe							
The seating arrangement seems pleasant in use							
The seating arrangement is multifunctional							
The seating arrangement seems practical in the functions it proposes							
The seating arrangement is nicely adaptable to my needs							
The seating arrangement has smart options that I would use							
The seating arrangement respects my invididual space							

21. **What score would you give to the overall concept?** *
Mark only one oval.

1	2	3	4	5	6	7	8	9	10

APPENDIX 8: SURVEY A

Page 1/5

Survey A: Section A

Thanks for participating in this survey! This survey will be used to score seating arrangements that you make during this observation study. The goal of this survey is to find out what you, as future user see as personal space within the proposed cabin.

1. **Name (optional)**

2. **What is your age?**
Mark only one oval.
- Under 18
- 18 - 24 years old
- 25 - 34 years old
- 35 - 44 years old
- 45 - 54 years old
- 55 - 64 years old
- 65 or older

3. **What is your current household situation?**
Mark only one oval.
- Single, living alone
- Single, living with family or friends
- Living with boyfriend or girlfriend
- Married, no children
- Married, with one child
- Married, with two children
- Married, with more than two children

4. **What is your weight?**

5. **What is your height?**

Page 2/5

6. **Statement Cards**
Mark only one oval per row.

	Completely disagree	Mostly disagree	Slightly disagree	Undecided	Slightly agree	Mostly agree	Completely agree
I feel comfortable being alone with the other participant							
I experience nausea while commuting in general							

Survey A: Section B

7. **Scoring situation 1:**
Mark only one oval per row.

	Completely disagree	Mostly disagree	Slightly disagree	Undecided	Slightly agree	Mostly agree	Completely agree
The seating arrangement that we decided on respects my personal space that I require							
The seating arrangement that we decided on is comfortable							
The seating arrangement that we decided on feels safe							
I would be able to enjoy my personal space in this seating arrangement even if there were two more occupants sitting in the cabin							

Page 3/5

10. **Scoring situation 4:**
Mark only one oval per row.

	Completely disagree	Mostly disagree	Slightly disagree	Undecided	Slightly agree	Mostly agree	Completely agree
The seating arrangement that we decided on respects my personal space that I require							
The seating arrangement that we decided on is comfortable							
The seating arrangement that we decided on feels safe							
I would be able to enjoy my personal space in this seating arrangement even if there were two more occupants sitting in the cabin							

11. **Scoring situation 5:**
Mark only one oval per row.

	Completely disagree	Mostly disagree	Slightly disagree	Undecided	Slightly agree	Mostly agree	Completely agree
The seating arrangement that we decided on respects my personal space that I require							
The seating arrangement that we decided on is comfortable							
The seating arrangement that we decided on feels safe							
I would be able to enjoy my personal space in this seating arrangement even if there were two more occupants sitting in the cabin							

Page 4/5

12. **Scoring situation 6:**
Mark only one oval per row.

	Completely disagree	Mostly disagree	Slightly disagree	Undecided	Slightly agree	Mostly agree	Completely agree
The seating arrangement that we decided on respects my personal space that I require							
The seating arrangement that we decided on is comfortable							
The seating arrangement that we decided on feels safe							
I would be able to enjoy my personal space in this seating arrangement even if there were two more occupants sitting in the cabin							

13. **Scoring situation 7:**
Mark only one oval per row.

	Completely disagree	Mostly disagree	Slightly disagree	Undecided	Slightly agree	Mostly agree	Completely agree
The seating arrangement that we decided on respects my personal space that I require							
The seating arrangement that we decided on is comfortable							
The seating arrangement that we decided on feels safe							
I would be able to enjoy my personal space in this seating arrangement even if there were two more occupants sitting in the cabin							

Page 5/5

8. **Scoring situation 2:**
Mark only one oval per row.

	Completely disagree	Mostly disagree	Slightly disagree	Undecided	Slightly agree	Mostly agree	Completely agree
The seating arrangement that we decided on respects my personal space that I require							
The seating arrangement that we decided on is comfortable							
The seating arrangement that we decided on feels safe							
I would be able to enjoy my personal space in this seating arrangement even if there were two more occupants sitting in the cabin							

9. **Scoring situation 3:**
Mark only one oval per row.

	Completely disagree	Mostly disagree	Slightly disagree	Undecided	Slightly agree	Mostly agree	Completely agree
The seating arrangement that we decided on respects my personal space that I require							
The seating arrangement that we decided on is comfortable							
The seating arrangement that we decided on feels safe							
I would be able to enjoy my personal space in this seating arrangement even if there were two more occupants sitting in the cabin							

APPENDIX 9: PROTOCOL

Materials check-up:
1. Twenty copies of Survey A
2. Forty copies of the consent form
3. GoPro with the battery pack. Make sure that the battery is full, that there is enough memory and that the recording starts before the first scenario.
4. Food & Drinks, Two books, A laptop, A tablet, Headset, two pens, cushions

Give a short introduction to the project:
With the introduction of autonomous cars, the space within these vehicles will drastically change. We as users can now define how we would want to sit and spend our time in it. Before doing in-depth researches into optimizing comfort in the seating, we should look into possible new seating positions that are possible when all driving tasks happen by the car. Ride-sharing is booming and you, as a future user, will surely make use of this. So, imagine being with a friend sitting in this car. How would you want to position the seats? You are asked first to fill in Section A of Survey A and after it, we will start with the observational study. In this study, you can make use of the seats and position them as you like. Here are 7 scenarios and we will do all of them.

In the first example, Participant A is asked to sleep while Participant B should eat. Please position the seats within the boundaries of the cabin. The main goal is to place the seats while thinking of each other's personal space, comfort, and safety. so interact with each other and come up with a solution in which you are both satisfied. When satisfied, take a seat and start doing the tasks that are described to you. After 20 seconds I will ask you if you are satisfied as it is, if not, you can move the seats around until you are both satisfied. When satisfied, you can fill in Scenario 1 of Section B. In the meantime, I will take the seats out so we can start with the next scenario.

During this study, I will take a top view video which will be used to analyze your seating positions. Please think loudly and interact with each other. Thanks, and enjoy.

Let them fill in Section A of survey A
Make sure that section A is filled in before continuing.

Propose the following scenarios:
(Start with one seat in a relaxed posture and one in standard posture)

-sleep and eat
-private and sleep
-sleep and sleep

(change the standard posture to relaxed posture)

-eat and private

(change both seats to standard posture)

-socialize
-private and private
-eat and eat

Let them fill in the scenario questions in Section B of survey A after each scenario

APPENDIX 10: CONSENT FORM

I volunteer to participate in this Experimental Exploratory Study conducted by Onder Turgut (the Researcher) in collaboration with Martur and TU Delft. I understand that the study is designed to gather information about the future of automotive interior in self-driving cars. I will be one of approximately 20 people that participate in this study.

1. My participation in this study is voluntary. I understand that I will not be paid for my participation. I may withdraw and discontinue participation at any time without penalty. If I decline to participate or withdraw from the study, no one on my campus will be told.

2. I understand that most participants will find the study interesting and thought-provoking. If, however, I feel uncomfortable in any way during the study, I have the right to decline to answer any question or to end the study.

3. Participation involves being observed by the researcher. The study will last approximately 20-30 minutes. Notes will be written during the study. A video of the study and subsequent dialogue will be recorded. This video will only be used for educational purposes and will not be shared with third parties unless noted otherwise. If I don't want to be recorded, I will not be able to participate in the study.

4. I understand that the researcher will not identify me by name in any reports using information obtained from this study and that my confidentiality as a participant in this study will remain secure. Subsequent uses of records and data will be subject to standard data use policies which protect the anonymity of individuals and institutions.

5. I understand that this observational study has been reviewed and approved by the Department of Design Engineering at the faculty of Industrial Design, TU Delft. For research problems or questions regarding subjects, the researcher may be contacted through email: reyberturgut@gmail.com

6. I have read and understood the explanation provided to me. I have had all my questions answered to my satisfaction, and I voluntarily agree to participate in this study.

7. I have been given a copy of this consent form.

_____ My Signature
_____ My Printed Name
For further information, please contact:
Prof. Dr. Peter, Vink
_____ Date
_____ Signature of the Researcher

General Information							
group	name	age	current household situation	weight (kg)	height (cm)	I feel comfortable being alone with the other participant	I experience nausea while commuting in general
1	Meny	35-44 years old	married, no children	47	165	6	5
	Gubing	18-24 years old	single, living alone	55	170	7	1
2	Charity	18-24 years old	living with boyfriend or girlfriend	52	162	7	5
	Ayyoeb	18-24 years old	living with boyfriend or girlfriend	85	175	7	2
3	Ahmet Arif	Under 18	single, living with family or friends	70	183	7	3
	Murat	18-24 years old	single, living with family or friends	58	174	6	1
4	Berzan	18-24 years old	single, living with family or friends	64	186	7	3
	Dicle	Under 18	single, living with family or friends	47	160	7	2
5	Ilyasse	18-24 years old	single, living with family or friends	75	177	6	1
	David	18-24 years old	single, living with family or friends	78	186	7	2
6	Ozan	18-24 years old	single, living with family or friends	78	175	6	1
	Gulperi	18-24 years old	single, living with family or friends	58	160	7	5
7	Muhammed	18-24 years old	single, living with family or friends	83	180	6	1
	Ali Omer	25-34 years old	single, living with family or friends	77	164	6	2
8	Rohat	25-34 years old	single, living with family or friends	76	173	7	1
	Sumeye	18-24 years old	single, living with family or friends	52	164	6	3
9	Kadri	18-24 years old	single, living with family or friends	71	172	6	1
	Nedim	25-34 years old	single, living with family or friends	72	173	6	2
min				47	160	6	1
max				85	186	7	5
average				66,6	172,2	6,5	2,3
median				70,5	173	6,5	2

APPENDIX 12: SCORING ATTRIBUTES SURVEY A

Scoring scenario 1				
group	The seating layout that we decided on respects my personal space that i require	the seating layout that we decided on is comfortable	the seating arrangemenent that we deicded on feels safe	I would be able to enjoy my personal space in this seating layout even if there were two more occupants sitting in the cabin
1	5	6	6	4
	6	6	6	5
2	6	6	6	5
	7	7	7	4
3	7	7	7	7
	7	7	6	6
4	6	6	6	6
	7	7	7	7
5	7	7	7	5
	7	6	7	6
6	6	7	6	3
	7	3	3	5
7	6	6	4	3
	5	5	6	3
8	7	7	6	6
	7	7	7	7
9	6	6	4	3
	6	6	6	5
	6,388888889	6,222222222	5,944444444	5

Scoring scenario 2				
group	The seating layout that we decided on respects my personal space that i require	the seating layout that we decided on is comfortable	the seating arrangemenent that we deicded on feels safe	I would be able to enjoy my personal space in this seating layout even if there were two more occupants sitting in the cabin
1	5	5	5	3
	6	6	6	6
2	6	6	6	5
	6	7	7	7
3	7	7	7	7
	7	6	7	6
4	7	5	4	3
	7	6	6	5
5	7	7	7	6
	7	7	7	3
6	7	7	6	3
	5	5	3	2
7	6	6	5	2
	6	6	6	5
8	7	7	7	7
	7	7	7	7
9	7	6	6	7
	6	6	6	7
	6,444444444	6,222222222	6	5,055555556

Scoring scenario 3				
group	The seating layout that we decided on respects my personal space that i require	the seating layout that we decided on is comfortable	the seating arrangemenent that we deicded on feels safe	I would be able to enjoy my personal space in this seating layout even if there were two more occupants sitting in the cabin
1	6	6	6	3
	5	4	6	5
2	7	7	7	7
	7	7	7	4
3	7	7	6	3
	7	7	7	4
4	7	7	5	3
	5	5	5	4
5	6	7	7	6
	7	7	7	6
6	7	7	5	1
	7	6	5	1
7	7	7	7	6
	6	6	6	5
8	7	6	6	5
	6	6	7	3
9	6	6	7	3
	6	6	6	3
	6,444444444	6,333333333	6,222222222	4

Scoring scenario 4				
group	The seating layout that we decided on respects my personal space that i require	the seating layout that we decided on is comfortable	the seating arrangemenent that we deicded on feels safe	I would be able to enjoy my personal space in this seating layout even if there were two more occupants sitting in the cabin
1	6	5	6	6
	6	6	6	6
2	7	7	7	3
	7	7	7	6
3	7	7	7	7
	7	7	7	7
4	7	7	7	7
	7	6	5	3
5	7	7	7	4
	7	7	6	2
6	7	7	6	5
	6	7	5	7
7	5	3	2	2
	6	6	6	5
8	7	7	7	7
	7	7	7	7
9	6	7	5	3
	6	6	6	6
	6,555555556	6,444444444	6,055555556	5,166666667

Scoring scenario 5				
group	The seating layout that we decided on respects my personal space that i require	the seating layout that we decided on is comfortable	the seating arrangemenent that we deicded on feels safe	I would be able to enjoy my personal space in this seating layout even if there were two more occupants sitting in the cabin
1	6	5	6	5
	6	6	6	5
2	7	7	6	6
	7	7	6	7
3	7	7	7	7
	7	7	7	7
4	5	7	3	7
	7	6	7	2
5	7	7	7	3
	6	6	4	2
6	7	7	6	1
	7	7	7	1
7	6	6	5	3
	6	6	6	3
8	7	7	7	7
	7	6	7	7
9	7	7	6	6
	7	7	7	7
	6,611111111	6,555555556	6,111111111	4,777777778

Scoring scenario 6				
group	The seating layout that we decided on respects my personal space that i require	the seating layout that we decided on is comfortable	the seating arrangemenent that we deicded on feels safe	I would be able to enjoy my personal space in this seating layout even if there were two more occupants sitting in the cabin
1	6	6	6	3
	7	6	6	6
2	7	7	7	5
	7	7	7	6
3	7	7	7	7
	7	7	7	7
4	7	7	7	7
	6	4	3	3
5	7	6	7	6
	7	7	6	2
6	7	7	7	2
	5	5	3	2
7	7	6	7	7
	6	6	6	6
8	7	7	7	7
	4	7	7	7
9	7	7	5	5
	6	7	5	5
	6,5	6,444444444	6,111111111	5,166666667

Scoring scenario 7				
group	The seating layout that we decided on respects my personal space that i require	the seating layout that we decided on is comfortable	the seating arrangemenent that we deicded on feels safe	I would be able to enjoy my personal space in this seating layout even if there were two more occupants sitting in the cabin
1	6	6	6	7
	6	6	5	6
2	7	7	7	6
	7	7	7	6
3	7	7	7	7
	7	7	7	7
4	7	6	4	6
	7	7	5	6
5	7	7	7	3
	6	6	6	2
6	7	7	7	6
	7	6	5	1
7	6	6	7	7
	7	7	6	6
8	7	7	7	7
	7	7	7	7
9	6	5	6	7
	6	6	6	7
	6,666666667	6,5	6,222222222	5,777777778

APPENDIX 13: SgRP COUPLE DISTANCES

seating position in scenario 1			
	Digitally measured in Illustrator	SgRP Couple Distances	Correction at 500mm height
group 1	6,42	95,658	84,46397872
group 2	7,1	105,79	93,41031915
group 3	15,98	182,172	160,854
group 4	18,25	208,05	183,7037234
group 5	9,92	113,088	99,85429787
group 6	15,81	180,234	159,1427872
group 8	13,1	149,34	131,8640426
min		95,658	84,46397872
average		147,7617143	130,4704498
maximum		208,05	183,7037234

seating position in scenario 2			
	Digitally measured in Illustrator	SgRP Couple Distances	Correction at 500mm height
group 3	17,47	199,158	175,8522766
group 4	19,17	218,538	192,9644043
group 5	20,8	237,12	209,3719149
group 7	23,05	262,77	232,0203191
min		199,158	175,8522766
average		229,3965	202,5522287
maximum		262,77	232,0203191

seating position in scenario 3			
	Digitally measured in Illustrator	SgRP Couple Distances	Correction at 500mm height
group 1	9,48	141,252	124,7225106
group 4	8,72	99,408	87,77514894
group 7	27	307,8	271,7808511
min		99,408	87,77514894
average		182,82	161,4261702
maximum		307,8	271,7808511

seating position in scenario 4			
	Digitally measured in Illustrator	SgRP Couple Distances	Correction at 500mm height
group 1	9,25	137,825	121,6965426
group 2	9,4	140,06	123,67
group 3	13,01	148,314	130,9581064
group 6	11,12	126,768	111,9334468
group 8	11	125,4	110,7255319
			0
min		125,4	110,7255319
average		135,6734	119,7967255
maximum		148,314	130,9581064

seating position in scenario 5			
	Digitally measured in Illustrator	SgRP Couple Distances	Correction at 500mm height
group 2	11,7	174,33	153,9296809
group 3	21,71	247,494	218,5319362
group 4	19,72	224,808	198,5006809
group 5	21,94	250,116	220,8471064
group 6	25,59	291,726	257,5878511
min		174,33	153,9296809
average		237,6948	209,8794511
maximum		291,726	257,5878511

seating position in scenario 6			
	Digitally measured in Illustrator	SgRP Couple Distances	Correction at 500mm height
group 5	20,45	233,13	205,8488298
group 6	25,92	295,488	260,909617
group 8	14,93	170,202	150,2847447
min		170,202	150,2847447
average		232,94	205,6810638
maximum		295,488	260,909617

seating position in scenario 7			
	Digitally measured in Illustrator	SgRP Couple Distances	Correction at 500mm height
group 2	7,8	116,22	102,6197872
group 6	11,48	130,872	115,5571915
group 8	10,47	119,358	105,3905745
min		116,22	102,6197872
average		122,15	107,8558511
maximum		130,872	115,5571915

APPENDIX 14: SgRP COUPLE DISTANCES

																								XX	YY	ZZ
	A	B1	B2	C1	C2	D1	D2	D3	D4	D5	E1	E2	E3	E4	F1	F2	F3	F4	F5	G1	G2	G3	G4			
A	0	3	2	2	3	1	2	0	2	3	1	4	5	4	3	1	2	3	3	5	1	1	2	53		
B1	3	0		1	5	2	4	3	2	3	2	4	4	4	0	3	4	3	5	4	2	3	2	63	3	21
B2	2		0	3	2	2	4	2	2	3	2	4	5	2	3	2	4	3	3	4	2	1	2	57	4	**14,25**
C1	2	1	3	0		1	3	2	1	2	1	3	5	3	2	2	3	2	4	3	1	1	1	46	3	15,33333333
C2	2	1	3		0	3	5	3	3	3	3	1	3	5	3	2	5	1	0	3	3	2	3	57	4	**14,25**
D1	1	2	2	1	3	0	X	X	X	X	0	4	6	4	3	1	3	3	3	5	0	1	2	44	1	44
D2	2	4	4	3	5	X	0	X	X	X	3	6	8	6	5	3	0	5	5	7	3	3	4	76	1	76
D3	0	3	2	2	3	X	X	0	X	X	1	4	6	4	3	1	2	3	3	5	1	1	2	46	2	**23**
D4	2	2	2	1	3	X	X	X	0	X	2	4	6	2	2	1	5	3	3	6	2	1	2	49	1	49
D5	3	3	3	2	3	X	X	X	X	0	3	3	5	4	3	2	4	1	3	4	3	2	2	53	1	53
E1	1	2	2	1	3	0	3	1	2	3	0	X	X	X	3	1	3	3	3	5	0	1	2	39	1	39
E2	4	4	4	3	1	4	6	4	4	3	X	0	X	X	4	3	6	4	1	2	4	3	2	66	4	**16,5**
E3	5	4	5	5	3	6	8	6	6	5	X	X	0	X	6	4	6	5	3	0	5	4	3	89	1	89
E4	4	4	2	3	1	4	6	4	2	4	X	X	X	0	2	1	5	3	3	6	2	1	2	59	1	59
F1	3	0	3	2	3	3	5	3	2	3	3	4	6	2	0	X	X	X	X	4	2	2	2	52	2	26
F2	1	3	2	2	2	1	3	1	1	2	1	3	4	1	X	0	X	X	X	3	1	1	1	33	2	**16,5**
F3	2	4	4	3	5	3	0	2	5	4	3	6	6	5	X	X	0	X	X	7	3	3	4	69	1	69
F4	3	3	3	2	1	3	5	3	3	1	3	4	5	3	X	X	X	0	X	4	3	2	2	53	1	53
F5	3	5	3	4	0	3	5	3	3	3	3	1	3	3	X	X	X	X	0	3	3	2	3	53	1	53
G1	5	4	4	3	3	5	7	5	6	4	5	2	0	6	4	3	7	4	3	0	X	X	X	80	2	40
G2	1	2	2	1	3	0	3	1	2	3	0	4	5	2	2	1	3	3	3	X	0	X	X	41	2	**20,5**
G3	1	3	1	1	2	1	3	1	1	2	1	3	4	1	2	1	3	2	2	X	X	0	X	35	1	35
G4	2	2	2	1	3	2	4	2	2	2	2	2	3	2	2	1	4	2	3	X	X	X	0	43	1	43

Table 5 The number of steps to go from any seating layout made by the participating group to any other seating layout. To find out which letter-combination is which seating layout, have a look at figure 9. XX= the sum of steps for that seating layout, YY= The amount of time this seating layout was chosen, ZZ= the resulting score, less is better.

APPENDIX 15: QUOTES FROM CONVERSATIONS

Group 1:

Scenario 1:

1. When eating she does not want to face someone face to face, so instead decide to sit next to her.
2. Prefer to have foldable table while eating.
3. Want to sleep on her side and this is not currently really possible.

Scenario 2:

1. While being private, she wants to enjoy the view and not distract the other occupant that is sleeping and at the same time she does not want to block the view for the other occupant.
2. She wants to avoid the window area and sleep in a dark space.
3. She wants a curtain to divide the occupants. This gives her a feeling that she is more safe and relaxed.

Scenario 3:

1. Normally she is used to sleep next to each other, but opposite is also okay in this case.
2. One occupant mentions that she does not want to sleep backwards because she may get car sick.
3. Sleeping opposite is compared to Chinese dormitory.

Scenario 4:

1. When spending time private, she wants to work

Scenario 5:

1. After seating they notice that it's a little too far for socializing.

Scenario 6:

1. While being both private, they would like to see the view
outside.

Scenario 7:

1. They would like to have a conversation while eating and having a table. Like during dinner.

Group 2:

Scenario 1:

1. "I do not notice a lot of my surroundings when I sleep so it is okay"
2. "When I eat it does not really matter how I sit"

Scenario 2:

1. "When I really feel sleepy, I want to have some personal space for myself"

Scenario 3:

1. "Let's swivel a little bit so we can look outside"
2. "Before sleep we could watch each other"
3. "When we sleep behind each other we really have space for ourselves"

Scenario 4:

1. "I'm going to sit in the front, so you do not look at me while I eat"
2. "When I sit in the car I prefer the right side. Oh, I always prefer the left side."
3. "Maybe I should sit a little bit more to the back. It will be safer probably this way. Oh well!"

Scenario 5:

4. "Should we sit opposite to each other or next to each other? I think when we sit next to each other you really need to turn your head, and this will not be comfortable if you do it for an hour. So, let's sit opposite to each other, next to the window. [after placing the seats] It looks a little far, so we should come closer to each other."
5. "When we sit next to the window, it's easier to look outside compared to sitting in the middle. Plus, it's easier this way, if you had two more occupants."

Scenario 6:

1. "I think that I would like to swivel it like how my boyfriend has done it."

Scenario 7:

1. "When we both eat, we should not be totally opposite to each other, but next to each other and swivel toward each other. Then you have space for yourself, but you can be together."
2. "Oh, but this way we could not really look outside so maybe we should just sit straight so we can enjoy the view outside while we eat."

Group 3:

Scenario 1:

1. "Can you sit a little bit in the front because you will be eating, and I will be sleeping?"

Scenario 2:

1. "When I want to be alone, I do not want to see him. The only thing that I want to see is the road and my phone."

Scenario 3:

1. "Should we sit like this, we will have a lot of space and will be looking to each other while sleeping."

Scenario 4:

1. "I'm going to sit in the back and you can be alone and do your thing."

Scenario 5:

1. "Shall we sit opposite to each other or next to each other? Let's try to sit next to each other, oh no, forget about that. I will get neck pain in that position."

Scenario 6:

1. "Let's sit opposite to each other with the backrest against each other. This way we will have more space and can really be alone."

Scenario 7:

1. "Can we talk and eat? Yes, like how you want."
2. "When I eat, I want to enjoy the view, so I will sit

in the front. This way II can look at things."
3. "I do not want to see you eat."

Group 4:

Scenario 1:
1. "I want to look outside when I eat."
2. "I need space for my legs when I sleep."

Scenario 2:
1. "[longitudinal seating position] In this position I get carsick, so the best is to sit facing the front."

Scenario 3:
1. "When I sleep like this, you would sit there. It feels quite good to sleep in this position."

Scenario 4:
1. "I do not really care how she sits, as long as I can eat."

Scenario 5:
1. "Are you going to sit like that? We should sit opposite to each other. Of course not! We normally always sit like this. But this is not a normal car."
2. "[when seating opposite] You should sit to the left, then we will have more space, so that other people can sit there. Let's sit to one side."

Scenario 6:
1. "I do not want to swivel the seat, because I will not have the view. The A-pilar will be in my way."

Scenario 7:
1. "You aren't going to eat like that. I need to be next to you. Or wait, let's sit like this, this is quite fancy."

Group 5:

Scenario 1:
1. "I'm going to sit next to him while eating. Oh, as long as you do not make any noise while eating, it's okay."
2. "I'm fine with him sitting next to me, as long as I have space for my legs."

Scenario 2:
1. "Do you want to look at me while I'm sleeping? I do not want you to do that. I do not feel comfortable like that."
2. "You do not want me to look at your phone, right? While you are doing private stuff."

Scenario 3:
1. "Let sit in the rear and just chill down. Or wait maybe it's better to move to the front a little in case that someone will hit us from the rear."
2. "I will stay in the rear. I just feel comfortable like this."

Scenario 4:
1. "[when sitting opposite to each other] Oh wait, he wants to be alone? Let me turn the seat so that he will have the space he wants."

Scenario 5 [use for presentation]:
1. "[when sitting next to each other] Oh, you want to sit next to each other? When I socialize, I need to look you in your eyes!"
2. "I do not trust the technology! I need to watch the road."
3. "[when sitting next to each other] But if we are like this, we will get pain in our neck at some point."
4. "[when sitting opposite to each other] To be honest, I do not like it to look him in the face the whole time
5. "[opposite to each other swiveled] this is chill, because you do not need to look at each other but you still feel like socializing."

Scenario 6:
1. "It is a little bit cold like this, but it respects being private."

Scenario 7:
1. "When we are eating we should talk. Let's sit like during socializing."

2. "We should maybe sit a little closer, in case that we want to give something to each other."

Group 6:

Scenario 1:
1. "[while sitting opposite] I do not like to sit like this, because of nausea. So, I want to sit next to my brother."

2. "[when sitting next to each other] We need to change this. There is a lot of room and I do not want to hear her eat so she needs to move forward a little or something should block the sound."

Scenario 2:
1. [When one occupant is sleeping longitudinal] sleeping like this feels strange? Why, while we take a long road you always sleep like this?"

2. "When I'm private I want to either play on my phone or look outside and occasionally I will look at you sleep. Normally this is strange, but because it's my brother, I'm okay with it."

3. "When I sit like this, I have the feeling that I make use of all the space around me and that just feels relaxed."

Scenario 3:
1. "If you get disturbed by me making sound while we sleep, I should move forward a little."
2. "I like to sleep in the rear, its more relaxing somehow."
3. "This gives me a feeling like we are sleeping in a bunk bed. We are not too far removed and get the space that we need."

4. "Imagine people outside seeing me while I am sleeping. Oh, do not worry about that, you can use opaque windows or curtains to block that."

Scenario 4:
1. "Because we know each other, I don't mind eating next to you, plus we are family, so I probably have asked you if you want to eat also."
2. "If you were eating while I was sleeping, I would get annoyed but because I'm awake and probably listening to music on my phone, it's okay."

Scenario 5:
1. "Normally (while eating, sleeping or being private) I would not like to sit opposite but during socializing it is okay."
2. "[while sitting opposite] If you feel that you need your own space for your legs I could move to the left."
3. "Socializing is really looking each other in the face."
4. "You can make sound while you sleep. Do not worry nobody sees you."

Scenario 6:
1. "When I sit forward, I still need some leg room for myself."
2. "This is like sleeping. When you sleep, you are also alone."
3. "When I'm being private, I occasionally want to look outside."
4. "During socializing I want to also watch outside occasionally."
5. "While being private, I do not even need to see you."

Scenario 7:
1. "I want to sit next to you because, I want to look forward while eating. We can imagine a table between us. I do not want to sit opposite while eating."

Group 7:

Scenario 1:
1. "I do not want to look at you when I wake up and I see you eating."
2. "I do not want to be opposite to each other when we sleep. I do not want to be looked at while sleeping."
3. "Let's sit like this, it feels like sunbathing. But somehow this feels less save."

Scenario 2:
1. "When I'm not sleeping, I don't mind being opposite to another person."

Scenario 3:
1. "[opposite to each other] When I'm sleeping, we should both swivel a little so that we don't face each other."

Scenario 4:
/

Scenario 5:
1. "We should sit diagonal so that we have more space."
2. "We should sit a little closer to each other so that others do not hear our conversations."

Scenario 6:
1. "When we are both being private, we should just both take the outer corner of the vehicle."

Scenario 7:

1. "We should just be opposite to each other while we eat."
2. "When we eat we should not be so close to each other as during socializing because of the sounds we make."

Group 8:

Scenario 1:
1. "It's good like this. I do not see her face while sleeping."

Scenario 2:
1. "When I sleep, I like to sleep against a wall (in a corner)."
2. "I need a curtain that makes the places dark, so I can sleep."

Scenario 3:
1. [sitting longitudinal] When seating, during brakes I will shake all ways."
2. "When I sleep, I need my personal space. I need to be alone."
3. "I do not even see you. Don't worry, you can sleep."

Scenario 4:
1. "Oh, now we are sitting in the front and I can enjoy the view."
2. "If he was eating something that makes a lot of sound, I would like him to sit far at the back."

Scenario 5:
1. "[when seating opposite] would you like to have a conversation like this? No, we should move forward and in a more upright angle."
2. "[swivel next to each other facing forward] We should swivel the seats, so we can enjoy the view at the same time."

Scenario 6:
/

Scenario 7:
1. "When we eat I shouldn't sit in front of you, we should be close to each other and talk."

Group 9:

Scenario 1:
1. "Sleeping must be in the rear."
2. "When I sleep I want to face forward: The way the car drives."

3. "I want to sleep inwards, and I do not want to see you eat."

Scenario 2:
1. "I want the seat to move gently while I sleep to give a massage-like feeling."
2. "I do not want to sit diagonally, while being private."

Scenario 3:
1. "I do not want to look at you while I sleep, and I do not want to sit next to you because it feels to close. I want a capsule that close me from you."
2. "I will not fall asleep as long as he is looking at me."
3. "I will never sleep if I am with a stranger."
4. "[when sleeping opposite to each other] Lets rotate so we will see each other less."

Scenario 4:
1. "I will never just only eat, instead while eating I watch a movie or do something else." Why are you always in a corner? I do not know, I like it like this.

Scenario 5:
1. "Let's sit next to each other without seeing others face."
2. "I want a table in the middle and just game."

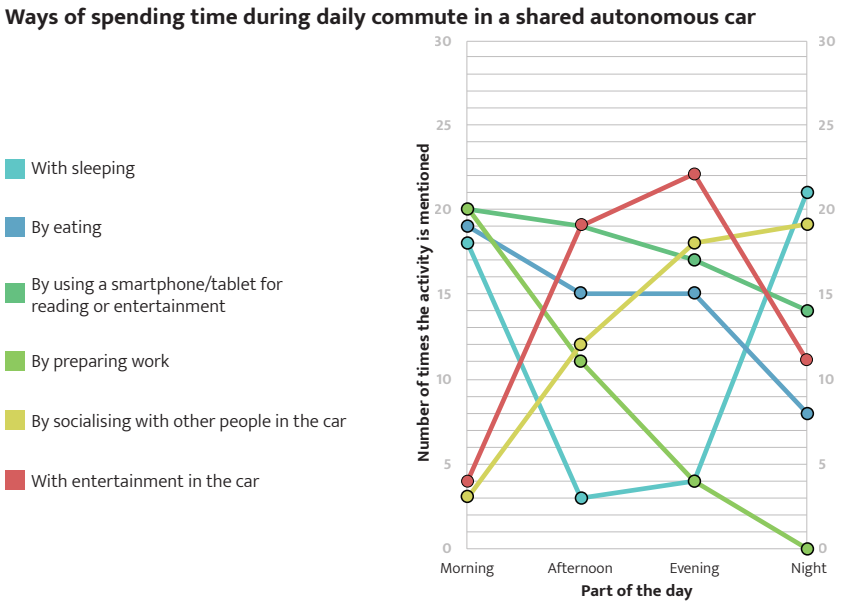
Scenario 6:
1. "Let's not see each other but at the same time the seats should not touch each other."

Scenario 7:
1. "We always eat together."

APPENDIX 16: EXPECTED USE CYCLE MECHANISM

The following assumptions are made:

1. The shared autonomous car is used between 06:00-24:00
2. The average commute time in the future is still around 50 minutes
3. The car is constantly in use with 10 minutes pick-up break
4. All possible seating layouts are used maximally once during the specific daytime
5. The figure (right) and table (beneath) are used to count the amount of possible seating layout during the specific daytime



Activity & activity	Participant 1:	Participant 2:
Scenario 1: sleep & eat	Sleep (relaxed posture)	Eat (standard posture)
Scenario 2: private & Sleep	Private (standard posture)	Sleep (relaxed posture)
Scenario 3: sleep & sleep	Sleep (relaxed posture)	Sleep (relaxed posture)
Scenario 4: eat & private	Eat (standard posture)	Private (standard posture)
Scenario 5: socialize & socialize	Socialize (standard posture)	Socialize (standard posture)
Scenario 6: private & private	Private (standard posture)	Private (standard posture)
Scenario 7: eat & eat	Eat (standard posture)	Eat (standard posture)

Result

daytime	time	use	Amount of uses	possible seating layout (amount)
morning	06:00-12:00	full use = 10 minutes break	6	1, 2, 3, 4, 6,7 (6)
afternoon	12:00-16:00	full use = 10 minutes break	4	4, 5, 6, 7, work, entertainment in car (6)
evening	16:00-19:00	full use = 10 minutes break	3	4, 5, 6, 7, entertainment in car (5)
night	19:00-24:00	full use = 10 minutes break	5	1,2,3,4,5,6,7, 4 occ, entertainment in car (9)
total			**18**	**26**
expected use cycle per dynamic seat	(Total amount of users) * (Total amount of possible seating layouts) * 13 years (Solopcms, 216)	2220660 use cycles		

APPENDIX 17: PROGRAM OF REQUIMENTS

The seating mechanism:

Requirements:

1. The seating mechanism should provide lateral- and rotational movements, which make all seating modes possible for the dynamic seats and reduce neck rotation during socializing.
2. The seating mechanism should provide enough stability against the vibrations that are caused during driving.
3. The seating mechanism should withhold normal forces up to 1500N
4. The seating mechanism should be controlled by the occupants with their smartphones or tablets
5. The seating mechanism should only change modes when the vehicle is not or minimally accelerating (highway-only).
6. The seating mechanism should have a lock feature that disables the seat from moving lateral or rotational (for example by an occupant moves on the seat) when it is not required.
7. These lock features should withstand the forces that are generated during a car crash.
8. The seating mechanism should not reduce freedom of movement (of the legs) of occupants
9. The seating mechanism should accelerate with a maximum acceleration of 0.5m/s/s and move not faster than 1m/s to ensure a pleasant movement (Rollon, Sander Gears, ATBautomation, 2018)
10. The seating mechanism should move the seats in a smart way without colliding occupants.
11. The seating mechanism is expected to work for 13 years with yearly maintenance (Solopcms, 2016). For one day it is expected that the seating mechanism changes approximately 468 times between modes. This accounts for a life cycle of approximately 2.200.000 cycles (see appendix 16).

Wishes:

1. The seating mechanism should function as simple as possible
2. The seating mechanism should be as light as possible.
3. The seating mechanism should not be viewable by the occupants.

The dynamic seats:

Requirements:

1. The seats should be able to provide the standard and relax postures
2. The chair height of the seats should be adjustable between (230mm-378mm) (Dined, 2018) so that P5 Dutch children (8 years old) and P95 Dutch Male 20-years old can all sit within these postures while having foot support
3. The dynamic seats should support side-ways sleeping.
4. [alternative] The dynamic seats should have adjustable foot support to compromise for the chair height difference between P5 Dutch children (8 years old) and P95 Dutch Male 20 years old males.
5. The dynamic seats should be made of robust materials that function properly while being used by dozens of different occupants.
6. The dynamic seats should fit all occupants between P5 Dutch children (8 years old) and P95 Dutch Male 20 years old males.
7. The dynamic seats should have a seat belt that is implemented into the seats.
8. The dynamic seats should have options that provide extra comfort like a massage by moving air bladders, lumbar support, various foam hardness, etc.
9. The dynamic seats should have armrest support
10. The dynamic seats should have a foldable table
11. The dynamic seats should use materials that have good resistance towards flammability, uv, tear, fluids, dirt, and wear. Examples are polyester and acrylic fibers.

Secondary seats:

Requirements:

1. The seating pan of the secondary seats should be foldable into the backrest to save space.
2. The seating pan of the secondary seats should withhold normal forces up to 1500N
3. The secondary seats should fit all occupants between P5 Dutch children (8 years old) and P95 Dutch Male 20 years old males.
4. The secondary seats should use materials that have good resistance towards fluids, dirt, and wear

The cabin

Requirements:

1. [alternative] The DLO should start at a minimum of 750mm and cover up until a height of 1300mm. (eye height 8 years old children + 20 years old male)
2. There should be room somewhere within the cabin for smartphone(s), coat(s), umbrella(s), bag(s), bottle(s), wallet(s), sunglass(es), and tablet(s)
3. There should be a foldable table that can be used during eating and socializing
4. The DLO should either have opaque window possibilities or curtains that give occupants the feeling of having privacy from outside, especially during sleep.
5. The cabin should use suicide door similar to the BMW i3, which makes easy ingress possible
6. The cabin should have corners that give the occupants the feeling that they are covered while sleeping

Wishes:

1. The styling of the cabin should resemble BMW's interior design, which is made of dynamic, fluid forms and resemble a perfect harmony of lively yet calm design (BMW, 2012).
2. The styling of the cabin should at the same time provide an atmosphere that makes it feel like your second living room.
3. The styling of the cabin should provide a feeling to the occupants that feels personal
4. The styling of the cabin should provide a feeling that it is safe
5. The styling of the cabin should provide the luxury in materials and details that above-average income car enthusiasts may have

APPENDIX 18: ADDITIONAL REQUIREMENTS

Seating mechanism

1. The seating mechanism should exist out of sliders, rails, a non-elastic rack with teeth, a connection platform, electronics (including batteries) & motors and a connection to the swivel prototype made by Martur
2. The sliders should have wheels that are tightly placed around the rails providing a locking system in case of a side collision
3. These wheels should have bearings in them, which make it possible for the wheels to follow a curved rail
4. The sliders should have a maximum speed of 1m/s on the outer rail
5. The rails should have a 4-points contact shape (similar to an I-beam) which divides the forces caused by the sliders, minimizing slip.
6. The outer rail should have an offset of 400mm to accommodate for the width of the dynamic seats.
7. The inner rail should have a radius of 120mm on the curved corners
8. The outer rails should have a dimension of around 2260mm * 1325mm
9. The rack should have teeth that have the same module, pressure angle, depth and thickness as the gear that is found on the shaft of the motor.
10. The rack should be a solid non-elastic shape, which ensures that the connected platform is following the same path as the rails.
11. The rack should be in-between both rails (offset around 200mm).
12. The connection platform should have multiple servo-motors at the middle that are connected to the rack
13. The connection platform should have M6 screws which connect the sliders unto the platform
14. The connection platform should be at least 6mm thick (when carbon steel is used) to ensure a safe FOS of 3 (SAE, 1966) with a normal force of 1500N on it (seat + occupant).
16. The connection platform should leave space for the batteries
17. The connecting parts should make use of standard industry material used for high load applications (Aluminium 2040 alloy for example)
18. The DC Motor should have atleast 250W power and an invertor
19. The thickness of the sheet metal should be minimalized to save weight and space

PARTICIPANT 1

ideal living room	scenario 5: Socializing	scenario 3: sleep	scenario 7: eat
1. Schilderij, kunstliefhebber. Het maakt het huis je eigen en laat zien wie je bent.	1. Telefoon, horloge, sleutels, portemonnee in broek	1. Lange tafel wordt gekozen	1. Pakt kussen als eerst en heeft vervolgens behoefte aan een deken
2. Bank	2. Planten voor social gevoel	2. Tv wordt voor geplaast. Niet per se om te kijken maar meer om die mogelijkheid te hebben.	2. Beide occupants hebben een nachtkastje nodig, en daarop de verplichte dingen. Telefoon moet opgeladen worden.
3. Boekenkast met persoonlijke dingen erop zoals merchandise en boeken	3. Tapijt wordt in midden van kamer geplaatst	3. Plantjes voor de sfeer. Naast de tv	3. Denkt dat er voldoende ruimte in het midden zit voor troep
4. Tv	4. Tafel over occupant heen voor eten (eten wordt vervolgens weer weggehaald)	4. Kapstok in hoek naast tv voor jas, tas en paraplu	4. Lampen op nachtkastje met boeken erbij
5. Gekke collectie van game consoles, plezier bij bezoek	5. Wilt tv ergens plaatsen maar kan geen goede positie vinden. Meer voor achtergrond geluid	5. Sleutel, telefoon en portemonnee in zak	5. Twee kapstokken in het midden zodat het niet te vol wordt. Ruimte voor de benen
6. Salontafel	6. Gebruikt een klein koffietafel ipv. Eettafel	6. Water op tafel	6. Denkt erover om de paraplu onder het nachtkastje te zetten maar denkt dat voeten nat worden
7. Raam -> naar buiten kunnen kijken	7. Tas wordt bij occupants gehouden onder tafel	7. Zonnebril opgeborgen in tas	7. Schoenen zijn uit tijdens het slapen
8. Mini fridge. Uit luiheid	8. Paraplu bij planten (later zou het net zo goed bij de kapstok kunnen)	8. Schoenen moeten uit en worden gedumpt in 'dump hoek' (bij kapstok), vanwege het respect hebben voor het eten.	
9. Lamp en verwarming, behoort tot iets wat je nodig hebt	9. Kapstok wordt in de hoek geplaatst samen met de jassen	9. Afstandbediening op tafel	
	10. Tas wordt verplaatst naar kapstok op grond	10. Leegte opvullen met tapijt	
	11. Op de koffietafel komt een zonnebril en een tas	11. Lamp tussen occupants in om eten te verlichten. Kaarslicht achtig dimmen	
	12. Hakken worden geplaatst naast kapstok		
	13. Water op koffietafel		
	14. Midden kamer voor lamp		

PARTICIPANT 2

ideal living room	scenario 5: Socializing	scenario 3: sleep	scenario 7: eat
1. Bank 3 delig, om elkaar heen om die groepsvibe te creeren	1. Kussen als eerst. Huiselijk gevoel	1. Twee aparte tafels waar je drinken bestek, eten kwijt kan	1. Tafel voor ipad en laptop. Even dingen checken van te voren
2. Projector, niet per see aan hebben. Alleen zodra je het nodig hebt	2. Tv moet middenpunt zijn en spullen om de tv heen. Ieder heeft 1 kant voor tv. Voor makkelijk	2. Tv voor	2. Spullen achter je hebben. Dat je ze niet ziet en niet over nadenken
3. Veel planten. Maakt kamer minder huiselijk. Meer verbonden met natuur. Binnencultuur voorkomen door natuurlijk dingen naar binnen halen.	3. Smartphone weg tijdens socializine	3. Geen kussens tijdens eten	3. Boeken en plantjes naast je hebben
4. Open ramen.	4. Koffer, portemonnee, schoenenshirt voor dumpruimte in hoek.	4. Laptop om af en toe dingen te checken	4. Tapijt in het midden weer
5. Goed geluidssysteem	5. Tv voor drankje of koffietje	5. Tijdens eten mag smartphone in de buurt blijven. Je mag multitasken ipv met iemand bezig zijn	5. Plantjes bij de voeten
6. Kunstwerken en boeken. Voegt wat elementen toe, dynamiek. Laat zien wie je bent ipv, leeg kaal en nikszeggend.	6. Planten zie ik niet zo snel in een auto	6. Weer een dumplek voor al je spullen achter de tv	6. Telefoon dichtbij
7. Oude herrineringen naar boven brengen	7. Schoenen gaan uit -> maakt het veel huiselijker		7. Nachtlampje naast nachtkasje. Zelf kiezen of je donker of lichter wilt hebben.
	8. Tapijt dat je een warm gevoel geeft		
	9. Kussens verdeelt		

PARTICIPANT 3

ideal living room	scenario 5: Socializing	scenario 3: sleep	scenario 7: eat
1. Lange loungebank	1. Waterfles aan raam kant. Later toch liever aan zijtafel	1. Tafel wordt als eerst geplaatst	1. Kussens zijn het eerste waaraan gedacht wordt tijdens het slapen
2. Tafel	2. Telefoon in zak	2. Vervolgens wordt de tv geplaatst	2. Zee geluiden zijn gewenst voor het stimuleren van het slapen
3. Tv	3. Tassen allemaal in een dumpruim-te achter. Niet zichtbaar voor occupants om druk gevoel te verminderen	3. Telefoon weer in zak	3. Dekens zijn gewenst
4. Pooltafel of ping pong tafel	4. Tafel inklapbaar maken	4. Tassen weer achter occupants	4. Schoenen bij deur of onder stoel
5. Ramen voor frisse lucht	5. Paraplu aan deur	5. Jassen en paraplu opbergen in hoekje	5. Tassen moeten weer niet gezien worden. Wordt vergeleken met de kelder thuis
6. Planten voor frisse blik	6. Kluisje om kleine benodigheden te plaatsen	6. Alle kleine benodigheden in deur naast occupant	6. Ruimte bij deur voor alle benodig-dheden
7. Kast	7. Kussens erbij. Hoe comfortabeler je zit, hoe beter de conversatie		7. Jassen in hoek
8. Tapijt	8. Jas aan stoel		
	9. Ipad op tafel om af en toe weg te kijken		

PARTICIPANT 4

ideal living room	scenario 5: Socializing	scenario 3: sleep	scenario 7: eat
1. Cozy maken dmv banken	1. Tv aan op de achtergrond voor licht muziek als afleiding	1. Tafels aan zijkant	1. tafels met entertainment en geluid om je heen
2. Tafel	2. Waterfles naast je	2. Muziek geluid vanuit de achterkant	2. geluid zorgt ervoor dat je je daar op kunt concentreren en slapen
3. Tv	3. Benodigheden als sleutels en portemonnee op tafel naast je	3. Tassen in het midden als het nodig is	3. benodigde spullen achter occupants
4. Geluidssyteem	4. Tijdens socializing is er toch wat ruimte nodig voor eten	4. Benodigheden spullen niet in zicht	
5. Gordijnen Te weinig licht geeft krap gevoel dus goed licht is gewenst terwijl er nog steeds privacy is	5. Tapijt is nodig tussen de voeten voor als je je schoenen uit doet en het een huizelijke gevoel geeft	5. Schoenen bij entree	
6. Koelkast voor drinken. Uit luiheid	6. Schoenen bij deur	6. Ruimte zorgt ervoor dat je je lekkerder voelt	
	7. Telefoon op tafel in geval van een telefoontje	7. Tv centraal	
	8. Jassen, paraplu en tassen afzonderlijk zetten achter voor dump ruimte.		

PARTICIPANT 5

ideal living room	scenario 5: Socializing	scenario 3: sleep	scenario 7: eat
1. (dag)Licht, geeft een energieke, vrolijke gevoel.	1. Tv wordt als eerst geplaatst	1. Tv wordt als eerst geplaatst. Plant- en naast tv	1. Nachttafel naast occupant waar de telefoon en benodigheden op kunne
2. Grote tv	2. Kleine tafel bij ingang voor benodigheden. Telefoon moet worden weggezet	2. Tapijt voor in de buurt van tv	2. Entertainment zoals laptops, ipads In de buurt
3. Woonkamer moet dicht bij tuin zijn voor als je naar buiten wilt. Natuurgevoel creeeren.	3. Jas hangen in hoek. Hoeft niet te zien	3. Dumphoek voor benodigheden	3. Tapijt in het midden om een huiselijk gevoel te geven
4. Comfort in banken is belangrijk. 3 hoeks banken om een lounge gevoel te creeren	4. Tafel in het midden is handig voor dingen als een waterfles en ipad	4. Tafel in het midden van de occupants	4. Dumphoek weer voor jas, paraplu e.d. uit zicht
5. Rustgevoel geven na een dag werken	5. Planten heel belangrijk. Overal plaatsen en ook naast de occupant	5. Tassen uit zicht. Achterkant van stoelen	5. Tas onder schoel
6. Toegankelijk naar keuken	6. Kussen achter hoofd plaatsen	6. Ergens een schilderij	6. Zonnescherm, gordijnen gewesnt
7. Grote huislamp (sierlamp) in het midden om een rustgevoel te creeren	7. Lamp en tapijt in het midden	7. Dumphoek voor jas, paraplu e.d. Uit zicht	7. Kraan
8. Boekenkast voor de sier	8. Tas onder stoel, vervelend om te zien maar moet wel bereikbaar zijn	8. Speakers in de hoeken achter occupants	
9. Eettafel	9. Dumphoek voor overige spullen	9. Koelkast voor koel drank	
10. Planten naast tv		10. Onzichtbaar prullenbak waarbij niet gedacht hoeft te worden aan stank	
11. Fotolijsten zijn belangrijk. Alles zie je wel terug in een restaurant behalve foto's van je dierbaren			

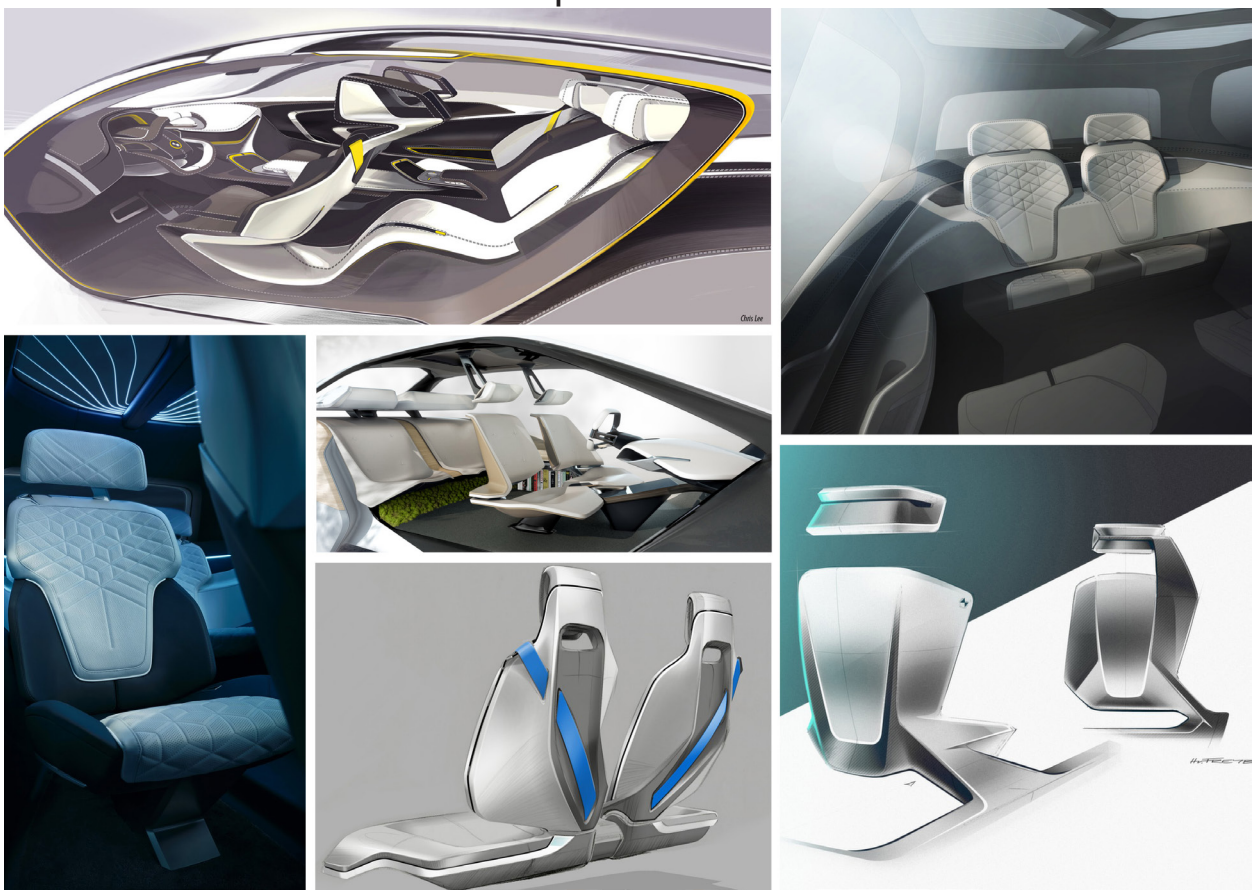
APPENDIX 20: PLACEMENT OF ITEMS

Socialize:	**Amount of participants that mentioned it**
- no strong desire for plants (2/5)	2 out of 5
- carpet in the middle (4/5)	4 out of 5
-table next to seat (3/5)	3 out of 5
-table in the middle (3/5)	3 out of 5
-tables always used to put drinks away (bottle, coffee) (5/5) and sometimes for tablets or the necessary stuff (2/5)	2 out of 5
-phone should be kept either far away, or in the pocket during socializing (4/5)	4 out of 5
- stuff like bags, jackets and umbrellas are kept out of view (4/5)	4 out of 5
- electronics (tablets, tv) are used as additional option during socializing when occupants do not desire to look outside or to each other or when they just want to hear something on the background (4/5).	4 out of 5
- The tv is in the opposite direction to the windows (3/5)	3 out of 5
- The necessary things and shoes are also sometimes placed at the entrance of the vehicle (3/5)	3 out of 5
- cushions are used to make the conversations more comfortable (3/5)	3 out of 5
Eat:	
- long table in front of the occupants (4/5) for food and bottles	4 out of 5
- Tv is placed at the front of the vehicle (5/5)	5 out of 5
- Occasionally, plants were placed next to the TV (2/5)	2 out of 5
- Surround sound (speakers in every corner) seems important while eating (2/5)	2 out of 5
- carpet in the middle (4/5)	4 out of 5
- bags are hold close by in case that something is necessary for the occupant (2/5).	2 out of 5
- otherwise, big luggage is hold behind the TV ((2/5) or behind the occupants (3/5)	3 out of 5
- the phone is kept away in the pocket (3/5) or in a table far away (2/5)	2 out of 5
- a fridge for drinks is mentioned (2/5)	2 out of 5
Sleep:	
- a night table is used (4/5)	4 out of 5
- carpet in the middle (3/5)	3 out of 5
- The necessary things are hold on the night table (3/5)	3 out of 5
- luggage is kept behind the occupant (4/5) or in front of the occupant (1/5)	4 out of 5
- entertainment like digital content or books are in reach to the occupant (4/5)	4 out of 5
- surround sound system is used as distraction (2/5)	2 out of 5
- plants are next to the occupants (1/5)	1 out of 5
- blankets are mentioned (2/5)	2 out of 5
- phone is kept on the night table instead of pocket (4/5)	4 out of 5

APPENDIX 21: MARTUR SEAT UNDERLAY

Production Models BMW

Concept Models BMW



APPENDIX 22: MARTUR SEAT UNDERLAY