Appendix

A styling strategy for
BYD commercial vehicles

Appendix

A | Appendix

IDE Master Graduation

Project team, Procedural checks and personal Project brief

This document contains the agreements made between student and supervisory team about the student's IDE Master Graduation Project. This document can also include the involvement of an external organisation, however, it does not cover any legal employment relationship that the student and the client (might) agree upon. Next to that, this document facilitates the required procedural checks. In this document:

- The student defines the team, what he/she is going to do/deliver and how that will come about.
- SSC E&SA (Shared Service Center, Education & Student Affairs) reports on the student's registration and study progress.
- IDE's Board of Examiners confirms if the student is allowed to start the Graduation Project.

USE ADOBE ACROBAT READER TO OPEN, EDIT AND SAVE THIS DOCUMENT
Download again and reopen in case you tried other software, such as Preview (Mac) or a webbrowser.

STUDENT DATA & MASTER PROGRAMME

Save this form according the format "IDE Master Graduation Project Brief_familyname_firstname_studentnumber_dd-mm-yyyy".
Complete all blue parts of the form and include the approved Project Brief in your Graduation Report as Appendix 1 !

family name: van Ommen
initials: R.S. given name: Ruben
student number: 4888294
street & no.:
zipcode & city:
country:
phone:
email:

Your master programme (only select the options that apply to you):
IDE master(s): ( ) IPD ( ) Dfl (★) SPD
2nd non-IDE master:
individual programme: 07 - 10 - 2020 (give date of approval)
honours programme: ( ) Honours Programme Master
specialisation / annotation: ( ) Medisign ( ) Tech. in Sustainable Design ( ) Entrepeneurship

SUPERVISORY TEAM **

Fill in the required data for the supervisory team members. Please check the instructions on the right !

** chair: Prof. dr. H.M.J.J. Snelders dept. / section: DOS
** mentor: Ir. W.F. Kets dept. / section: HCD
2nd mentor: P.R. Kiela MSc.
organisation: BYD Europe
city: Schiedam country: The Netherlands
comments (optional)

Chair should request the IDE Board of Examiners for approval of a non-IDE mentor, including a motivation letter and c.v..

Second mentor only applies in case the assignment is hosted by an external organisation.

Ensure a heterogeneous team. In case you wish to include two team members from the same section, please explain why.

APPROVAL PROJECT BRIEF

To be filled in by the chair of the supervisory team.

chair Prof. dr. H.M.J.J. Snelders date 07 - 10 - 2020 signature

CHECK STUDY PROGRESS

To be filled in by the SSC E&SA (Shared Service Center, Education & Student Affairs), after approval of the project brief by the Chair.
The study progress will be checked for a 2nd time just before the green light meeting.

Master electives no. of EC accumulated in total: 30 EC
Of which, taking the conditional requirements into account, can be part of the exam programme 30 EC
List of electives obtained before the third semester without approval of the BoE

(X) YES all 1st year master courses passed
( ) NO missing 1st year master courses are:

name C. van der Bunt date 23 - 11 - 2020 signature CB

FORMAL APPROVAL GRADUATION PROJECT

To be filled in by the Board of Examiners of IDE TU Delft. Please check the supervisory team and study the parts of the brief marked **.
Next, please assess, (dis)approve and sign this Project Brief, by using the criteria below.

- Does the project fit within the (MSc)-programme of the student (taking into account, if described, the activities done next to the obligatory MSc specific courses)?
- Is the level of the project challenging enough for a MSc IDE graduating student?
- Is the project expected to be doable within 100 working days/20 weeks ?
- Does the composition of the supervisory team comply with the regulations and fit the assignment ?

Content: (V) APPROVED ( ) NOT APPROVED
Procedure: (V) APPROVED ( ) NOT APPROVED
comments

name Monique von Morgen date 7/12/2020 signature MvM

Styling as a strategic tool for electric trucks — project title

Please state the title of your graduation project (above) and the start date and end date (below). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

start date 05 - 10 - 2020 — 12 - 03 - 2021 end date

INTRODUCTION **

Please describe, the context of your project, and address the main stakeholders (interests) within this context in a concise yet complete manner. Who are involved, what do they value and how do they currently operate within the given context? What are the main opportunities and limitations you are currently aware of (cultural- and social norms, resources (time, money,...), technology, ...).

Electrification of the urban transport system using electric trucks has a positive effect on the environmental impact of transport (Plötz et al., 2019). Therefore, it is important to transition from fossil fuel powered vehicles to electric vehicles. This transition is technologically challenging and the appearance of the vehicles could change. Predicting what electric trucks could look like would offer a manufacturer a strategic edge on its competitors.

This project will be done for the company BYD. BYD is a Chinese manufacturing company that produces batteries, electric vehicles and other electronic devices. BYD is an Original Equipment Manufacturer (OEM). Therefore, it has a lot of resources to develop new technology. What these resources exactly are, needs to be researched. BYD is launching Electric trucks to the European market.

The project elaborates on the connection between automotive strategy and styling, where styling can be a strategic tool for branding. There are factors influencing the styling of BYD vehicles such as the transition to electric driving. However, styling also affects how the brand is perceived by customers, users and from an outside perspective. It can be strategically used to create a positive brand image not only for the commercial vehicles but for BYD in general. In short, there are factors driving styling and there are factors driven by styling. By aligning these factors a future styling vision can be achieved.

This project will also be in collaboration with VanBerlo, a Dutch design agency. During this project VanBerlo will offer their expertise to develop a design strategy.

Currently BYD seems to have the same strategy for market development for the European market as they have for other markets around the globe. However, different countries and continents have different demands for their vehicles (Voelk, 2020). It is important for BYD to know the European context and what requirements the European market has for electric commercial vehicles. Then BYD can adjust their design (Technology), styling, launch strategy or infrastructure accordingly.

Plötz, P., Gnann, T., Jochem, P., Yilmaz, H. Ü, & Kaschub, T. (2019). Impact of electric trucks powered by overhead lines on the European electricity system and CO2 emissions. Energy Policy, 130, 32-40. doi:10.1016/j.enpol.2019.03.042

Voelk, T. (2020, March 04). Europe and the U.S. Share a Lot, Except When It Comes to Cars. Retrieved August 03, 2020, from https://www.nytimes.com/2020/03/04/automobiles/european-us-cars-automakers.html

space available for images / figures on next page

introduction (continued): space for images

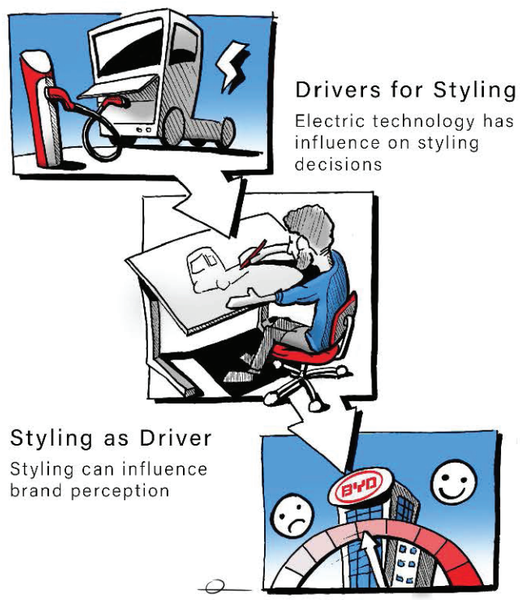


image / figure 1: Drivers for styling and styling as driver

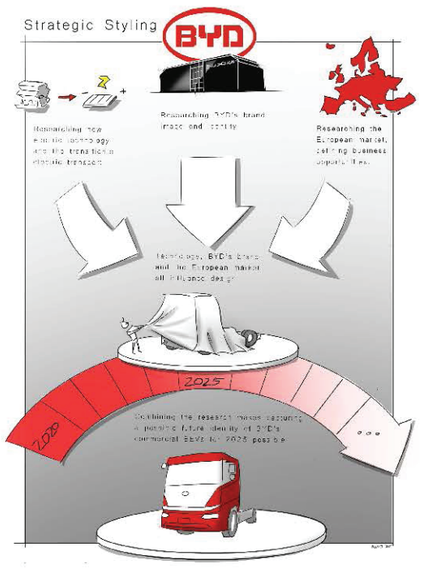


image / figure 2: Simple explanation of the project sent to BYD Design Headquarters

PROBLEM DEFINITION **

Limit and define the scope and solution space of your project to one that is manageable within one Master Graduation Project of 30 EC (= 20 full time weeks or 100 working days) and clearly indicate what issue(s) should be addressed in this project.

The project will be limited to the Electric Truck division of BYD Europe. In that domain Electric technology capabilities of BYD will be researched and its desired effect on the styling of the trucks to fit the European market.
Electrification offers new opportunities for efficiency of vehicles. This impacts overall design and styling. BYD wants to introduce their truck into the European market within 5 years. Being able to anticipate on future styling ensures a strong foothold in the (new) European market.

For a successful market development in the Europe there are some challenges for BYD:
- It is important to fully understand the European users of electric trucks.
- Aside from users and b2b customers, BYD also should take into account what the market trends are and what competitors are doing.
- It is important to know what the BYD brand stands for and how that translates to the styling of their products.
- BYD vehicles are styled and manufactured in China. According to (Ar & Kara, 2014)*, 'the country of production (COP) has a significant negative effect on brand image, brand trust and quality perception when consumers learned the COP was China.' A similar study from the United States Shows a similar negative attitude towards products made in China even though this is improving (Yang, 2020)*. It might be interesting for BYD to find out whether this phenomenon is affecting their brand and if so how to counter it.
- Technology is a driver for styling. It is important to understand what technical capabilities BYD has and how they affect styling.
- It is important to find out what technologies BYD's competitors are working on (those that are public) and to get a rough idea of possibilities.

*References in final comments

ASSIGNMENT **

State in 2 or 3 sentences what you are going to research, design, create and / or generate, that will solve (part of) the issue(s) pointed out in "problem definition". Then illustrate this assignment by indicating what kind of solution you expect and / or aim to deliver, for instance: a product, a product-service combination, a strategy illustrated through product or product-service combination ideas, ... In case of a Specialisation and/or Annotation, make sure the assignment reflects this/these.

Design a future styling strategy for BYD Electric trucks in Europe by defining market and technological context and showing how this translates to the styling of the vehicles and the BYD portfolio. To construct this strategy it is needed to research customers, market trends, electric technology today and in the future and the BYD brand and styling. This assignment is set for 100 workdays translating to 20 weeks full-time.

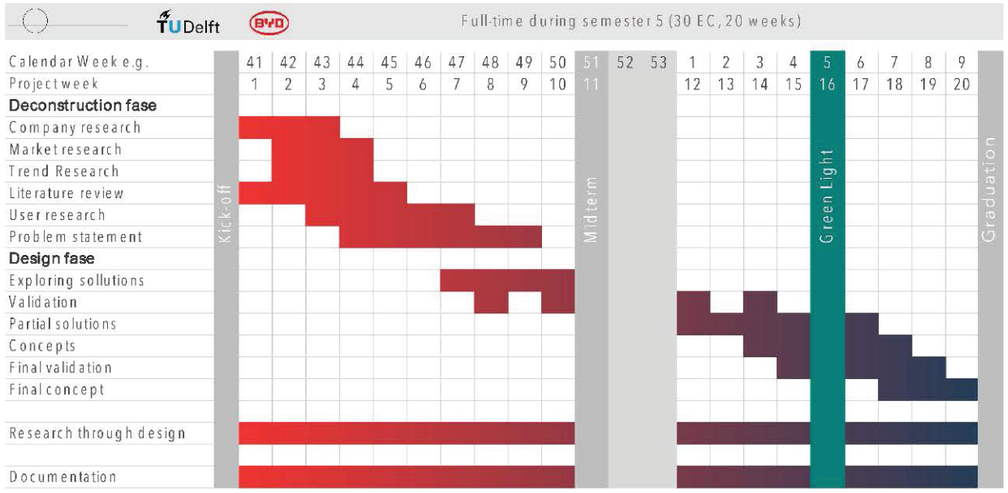
- Define what BYD can do to improve the position in the European market and visualize this in a clear design strategy/vision for BYD trucks Europe. Including: optimal use of electric technology according to wishes of the European market and styling according to brand image and brand identity of BYD.
- Presentation of research findings to support and justify the design strategy
- A roadmap for implementation of the design strategy.

Personal Project Brief - IDE Master Graduation

PLANNING AND APPROACH **

Include a Gantt Chart (replace the example below - more examples can be found in Manual 2) that shows the different phases of your project, deliverables you have in mind, meetings, and how you plan to spend your time. Please note that all activities should fit within the given net time of 30 EC = 20 full time weeks or 100 working days, and your planning should include a kick-off meeting, mid-term meeting, green light meeting and graduation ceremony. Illustrate your Gantt Chart by, for instance, explaining your approach, and please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any, for instance because of holidays or parallel activities.

start date 5 - 10 - 2020 12 - 3 - 2021 end date



The approach for this assignment will be to combine two methods: ViP and Research through design. The ViP method is used partially. The method is used to deconstruct the existing truck design and the problem statement from BYD. After deconstructing it will be possible to reframe the problem statement and construct new concepts. The concepts will be validated and redesigned if necessary. This process is repeated and validated several times which resembles the Research Through Design method. Even though the Research Through Design approach is most visible in the later stage of the project it will already be practiced at the start of the assignment.

Throughout the project it is vital to document everything in an early stage. It is a well-known pitfall to wait with documentation until the end of the assignment. It is easy to forget the decisions made in an early stage. For user research I plan to do interviews and facilitate creative sessions. All of these activities will most likely be online as the current situation with Covid-19 does not allow face to face contact.

MOTIVATION AND PERSONAL AMBITIONS

Explain why you set up this project, what competences you want to prove and learn. For example: acquired competences from your MSc programme, the elective semester, extra-curricular activities (etc.) and point out the competences you have yet developed. Optionally, describe which personal learning ambitions you explicitly want to address in this project, on top of the learning objectives of the Graduation Project, such as: in depth knowledge a on specific subject, broadening your competences or experimenting with a specific tool and/or methodology, ... Stick to no more than five ambitions.

This projects excites me very much. I have had a passion for cars, trucks, trains, boats and everything else that moves since I was very young. That coupled with a passion for design that I developed over the years and this assignment fits perfectly.

During my master SPD I have tried to combine tangible design (styling) to strategy because I feel that design is becoming less part of the curriculum even though I feel design is what sets the study apart from business strategy schools. I believe that it is possible to capture the strategic value of design (styling) in this assignment.

To prepare for an assignment like this I have followed: Strategic Automotive, Automotive 3D, Automotive sketching and ZEN Product design. These are some of the electives I have followed and the most relevant to this assignment.

During this project I hope to improve my design skills in the following subjects:
- Vehicle design skills
- Design presentation and proposals
- Creative facilitation
- Design research (Qualitative research methods and documentation)

FINAL COMMENTS

In case your project brief needs final comments, please add any information you think is relevant.

Ar, A. A., & Kara, A. (2014). Emerging market consumers' country of production image, trust and quality perceptions of global brands made-in China. Journal of Product & Brand Management, 23(7), 491-503. doi:10.1108/jpbm-12-2013-0472
Yang, C. (2020). How China's image affects Chinese products in a partisan-motivated US market. Global Media and China, 5(2), 169-187. doi:10.1177/2059436420922702

Appendix | A

B | Appendix

In this appendix the summaries of the interviews conducted are listed. The interviews were conducted in Dutch, then summarized and then translated to English.

The setup was a semi-structured interview with leading questions. The questions are listed below. For each of the interviews the basic setup was the same with minor variations in questions used.

After a short introduction about the interviewer and the assignment these were the questions asked to the participant. The questions are not in order and not every question has been used in every interview. The questions:

- For how long have you been a fleet manager?
- What does a fleet manager do?
- What are the main features to look for when purchasing trucks?
- What kinds of vehicles does the company have in their portfolio now?
- What are the different applications for which vehicle?
- What are the major trends in the commercial vehicle or logistics market?
- How does a day of a PostNL driver look?
- What are their core tasks?
- Can they choose their vehicles?
- What are driver's complaints about vehicles or in general about the fleet?
- How do you deal with suggestions/comments from drivers?
- What could be improved on the currenct commercial vehicles?
- What do you want from your vehicles and the seller?
- What the impact of going electric?
- How will cities adjust their infrastucture?
- What challenges are there for going electric?
- Are there extra challenges with electric transport?
- What should a manufacturer like BYD do?
- Politics between companies is difficult. Some are claiming companies should work together, also with charging electric vehicles, but many companies do not want that. How will cities cope with this problem?
- Are smaller companies interested in sharing loads opposed to larger firms?
- Which market/sector is most interesting for a commercial vehicle manufacturer?
- What do you expect with autonomous driving?
- Given a blank slate, how would your ideal solution for commercial transport look?

B1 Summary of Interview with Mike Levens (bluekens)

Mike Levens is an EV Specialist Technical Sales Engineer at Bluekens EV. Among his activities are:
Sales engineering, Sales support, Project based sales for zero emission vehicles with the exception of aftersales. Bluekens Truck and Bus focusses on trucks, buses and vans. Bluekens works with BYD.

Bluekens specifically separated the electric vehicles from the diesel vehicles. The way they approach it is to offer electric solutions for companies. They offer an electric 'concept', including infrastructure and vehicles. According to Mike Levens it is impossible to sell separate vehicles to larger companies without also selling the charging infrastructure.

There are many different clients for Bluekens. A client could be a small shop on the corner of the street or large logistics companies who would like to (partially) change their fleet to green and/or zero emission transport. Bluekens does not sell buses. These are bought by public transport operators directly from factories. Bluekens then prepares the buses for each client and does maintenance.

Small business owners are not often transitioning to electric vehicles. We do see a demand for electric in construction, especially because there has been some bad press around nitrogen in construction work in the Netherlands. There are some interesting developments around their logistics. For instance: having a prefabrication site on a location just outside a city where parts of buildings are assembled and then transported to the city center. Especially for that last mile transport of pre-fabricated components there is a demand for emission free. These construction companies are asking bluekens for electric solutions. They often need smaller electric vans with an open load, pick-up type, load space and a small crane.

Within construction there is a slowly increasing demand for bigger vehicles but these bigger trucks are not really available yet. Municipalities could use a bigger truck that is electric. Garbage collecting might be a good application for lager electric trucks.

OEM's are now starting to focus on producing 18t and 26t electric trucks.

In general everyone wants to achieve the goals set by the Paris Agreement. But the areas where this proves to be most difficult are urban areas. In and close to cities the air quality and pollution is worse. So if a local government can show that their vehicles are emission free that sets an example for companies within their municipality.

Challenges
It depends on what is in production. Often electric vehicles that are in production, are not available in larger quantities.
When looking at the vehicles themselves, for instance a Renault or Volvo truck, the products seem fine and capable. The biggest challenge lies in changing the infrastructure around the vehicles. Logistics companies are set to have their vehicles running for as much time as possible. The difference with electric vehicles is that these vehicles need to be charged every day, sometimes more. This poses several difficulties for logistics companies trying to keep their fleet running at all time.

B | Appendix

There is a lack of knowledge around zero emission. Typically clients are forced to become emission free, either by their buyers or clients. That is most often the main reason to change. Most companies do not start to transition by themselves.

There are many stigmas around electric driving. Clients are afraid of trucks running out of battery, not making the distances and needing too much time to charge. They have questions about the charging sequence, how much power that would cost and whether that is possible in their warehouses.

Sales
Bluekens searches for solutions for their clients. Sometimes there is more possible. For example, customers might already have the capacity of power on their roof in the shape of solar panels.

The truck of the future is either electric or hydrogen electric. In both cases driven by an electric motor.

Mike Levens believes that some of the vehicles might become autonomous but certain branches of logistics will always need manpower like at home delivery and garbage disposal.

Advantages of electric
There are advantages of electric. There are regulations for retail preventing them from restocking shops at night because of noise. Electric vehicles do not make noise and this could be an advantage for those clients.

There are also advantages in construction work. For example a cement truck. Nowadays when a cement truck reaches the building site, they have to run stationary in order to turn the cement bucket and prevent the cement from drying out. Running stationary makes a lot of noise with these trucks. Having an electric truck and electric cement bucket would make no noise.

The torque of an electric truck is more than a diesel truck. This could be an advantage. On the long haul the decreased acceleration time could mean a shorter overall time on a route. On the long term, the overall performance of electric vehicles could be better than diesel vehicles.

Trends in electric vehicles
The offer is pretty much the same with each company. What Mike Levens sees now is that there are still many custom builders converting ICE vehicles from diesel to electric. However this is a dying market and becoming less and less viable. What is available now are the light commercial vehicles. Larger commercial vehicles are starting to become available. What does stand out that these are often very similar to conventional diesel trucks.

The development of electric trucks from scratch exploiting the electric technology, is not being done yet. Even the BYD vehicles do not seem to be developed as electric vehicles rather as diesel vehicles with an electric motor. This is surprising when looking at the company history of BYD. With their expertise on electric (battery) technology.

Currently the vehicles are similar in styling to ICE vehicles. This is partly driven by the clients. They want a familiar vehicle. Clients feel like the transition to electric is going too fast. They come from a diesel age and have diesel infrastructure. So they have to change a lot in order to transition. On top of that, the drivers have to adjust. There is a shortage of drivers and putting a driver in a completely different vehicle might be going too far and may be scary to them. The drivers are often forgotten in the process of designing electric vehicles. On one side it might be good to hold on to the traditional styling. On the other hand sticking to the ICE type styling causes many limitations. Electric technology offers advantages that are not being exploited at this time.

There is a shift towards TCO. Normally TCO would mean: Total Cost of Ownership. The new meaning is: Total Cost of Operation. On the longer term an electric vehicle might be less expensive than a diesel vehicle.

Ideal solutions
The ideal solution for electric vehicles would be a modular vehicle. Not in the sense of a cabin with different possibilities for cargo, as is now. In the sense of a real modular platform where the size can be changed in a simple fashion. In that way a OEM could offer solutions that would fit many different clients. At this moment portfolios of a single manufacturer are often not enough versatile. That means drivers of logistics companies need to change between brands of vehicles within the same company.

Safety is a very important aspect of commercial vehicles. Mike Levens believes that autonomous driving could be used to improve safety in commercial vehicles. As example he takes Tesla who are capable to improve the safety with assisted driving. Electric vehicles are easier to control by software. With ICE vehicles this is much more difficult. Diesel engines react differently with different temperatures and there are a lot more mechanisms.

Mike Levens believes that the biggest change should take place in the infrastructure. Nowadays Logistics companies are not efficient in cities. A future where shipments could be combined by different logistics companies would be desired. This would mean hubs outside the city center where vehicles from multiple companies come together and combine their shipments before entering the city to prevent (almost) empty vehicles from riding around.

BYD's smaller vehicles do not really fit the market yet. The smaller vehicle (T3) is too small and the (T6) is too big. BYD should focus on 3,5t -5t vehicles.

The quality perception with BYD vehicles is not of the same level other brands. For Bluekens this is a problem because they have built their name around high quality products from Volvo for example. Bluekens has difficulty selling vehicles with a lower quality perception to its clients.

B | Appendix

B2 Summary of interview with Walther Ploos van Amstel

Walther Ploos van Amstel is Professor in City Logistics Amsterdam University of Applied Sciences.

Commercial Traffic
Parcel delivery is a relatively small part of the total stream of commercial vehicles in the city. Parcels make up for 4-9% of the total commercial traffic in a city. Even though the parcel delivery is still a growing market mr. Ploos van Amstel thinks the focus should not be on parcel delivery but on the other 96%. For instance construction logistics; 27% or General cargo and retail; 39%. Besides, the big parcel companies like DHL and PostNL work very efficient, there is not much to gain in that maket. Most of the cost for companies are in the first mile of the transport. Mr. Ploos van Amstel states that the focus should be on smaller companies. Either smaller players in logistics with less vehicles or on the small retailers. However, many small retailers often buy second hand vehicles.

Main trends
The main trends mr. Ploos van Amstel sees are that there will be an increase of electric vehicles and light electric vehicles. Most of the delivery vehicles transport 500kg or less. Therefore smaller electric vehicles are interesting. As an example mr. Ploos van Amstel mentions the light electric vehicle from PicNic, an online supermarket in the Netherlands. According to him these vehicles are the ideal size but still very expensive.

Safety
For the truck market it is important to support the driver in safety. Safety measures outweigh are more important than the transition to electric driving. For logistics companies the costs of insurance is higher than the cost to lease.

Regulations
In the meantime cities are restructuring their infrastructure to accommodate the increase of commercial vehicles in the city. Also to provide for electric vehicles. However, these are often not the initiatives from city councils but from large project developers. In Amsterdam alone 1 billion euros was invested to improve the infrastructure.

Autonomous driving
Mr. Ploos van Amstel says that autonomous driving will be a big part of city logistics in the future. In most cities in the Netherlands he expects autonomous deliveries will take place, or situations where a former driver would walk a route and an autonomous vehicle will follow.

Fuso eCanter
Mr. Ploos van Amstel attended the launch of the Fuso eCanter in 2015. This vehicle is still being tested by companies as PostNL. When asked about the relevance of such vehicles mr. Ploos van Amstel answered that it is still relevant to make this sector electric. However, delivery vehicles in cities are getting smaller and logistics companies rather use vehicles that can be driven by drivers without a special driver's license. A 7500kg vehicle is as of yet not suitable but the regulations regarding weight are changing since electric vehicles are heavier. In the future it might well be possible that rules for the maximum weight of a vehicle are changed and even 7500kg vehicles can be driven with a regular driver's license.

What a company should offer
In the future the brands will become generic. It is important to deliver a service. This service could be around the charging infrastructure but each sector has different needs. If a company can deliver a total solution it will be preferred over just the vehicles.

B3 Summary of interview with Eduard Veen

Eduard Veen is fleet manager, senior advisor for the fleet. Cars, trucks, trailers and bikes. PostNL has multiple Bv's

PostNL wants to be emission free in 25 cities by 2025
In 2030 the entire last mile emission free in the Netherlands
For parcel and letters.

Eduard Veen knows BYD. Eduard Veen met with Bluekens truck and bus about the BYD T6.

PostNL parts for the Netherlands, Belgium and Luxembourg:

- Post (only the Netherlands)
- Parcel
- Tijdgebonden network: TGN (before post and parcel)
- Transport (internal and receiving freight from clients)
- 2 man shipments (larger items)
- Extra at Home (delivery and installation)
- JP Haarlem (furniture delivery)
- Pharma care (to pharmacists and hospitals)
- Secured transport (Extra security high value items)

PostNL is searching for suitable sustainable products for the right price. According to mr. Veen the electric car is becoming mainstream. The Light Commercial Vehicles are beginning to become more electric. Larger commercial electric vehicles are in a testing phase with PostNL. PostNL is testing Fuso eCanter 7,5 ton trucks.

PostNL is testing a new way of B2B city logistics in collaboration with the Hogeschool van Amsterdam and two start-ups. Where at the outskirts of the cities shipments of coffee, copying paper and toilet paper from different companies are bundled before entering the city to supply offices. This test is running with 6 electric Fuso E-Canter trucks. And is proving to be a difficult product. Especially during covid-19, Which meant a decrease of B2B supplying because of at home working.

Sustainability is multi-interpretable. For instance:

- The Paris accord is aimed at Co2 reduction which could be reached by using bio fuels or hybrid technology.

- But when talking about local emission rules the only solution to get to zero emission is to drive electric or with hydrogen.

- Another important item is city congestion. Congestion means shipments are delayed or cannot reach their destination. City centers might become car-free which is why PostNL is looking at bicycles as solution. Bicycles have their limit though since transporting heavy items is impossible.

An extra difficulty is the wish from consumers for free shipping and free return policies. Which increases the amount of shipping movements.

B | Appendix

When asked if PostNL tries to cooperate with competitors in the market to counter congestion in the city the answer is no. PostNL often receives this question. There is little room to combine shipments in parcel delivery. The vehicles are loaded to full capacity in the morning and return empty. It would be impossible to combine shipments. At this moment there are 1,7 million parcels being delivered on a daily basis by PostNL and this is growing. This means that for every 10 homes in the Netherlands there is a PostNL vehicle every day. So when looking at a typical Dutch suburban area with closely packed homes, this roughly translates to a delivery vehicle every 50 meters.

When looking at city logistics parcel delivery is 7-8% of the total amount of vehicles on the road. This is not much. But in the public perceive it to be more. This is due to the high visibility of the vehicles. People see the delivery vehicles often in their street. And because people can order for different time frames, the same vehicle might enter the same street 3 times per day. Leading to people thinking there are three times more vehicles. On top of that the recognition with large logistics companies is better. People recognize the bright orange of PostNL or the yellow and red by DHL. An unmarked van might enter a same street more often but is not recognized each time and therefore unnoticed and less visible.

As a fleet manager Eduard Veen is responsible for the purchasing of vehicles. He does this in cooperation with the operations department who will clarify which vehicles are needed. Eventually operations makes a choice.

- Length, width, height,
- Loading capacity
- Quality
- Price per km of month

When there are new developments or new products then these can be tested. The vehicles are a workspace for the driver. The fact that drivers must get in and out of the vehicles a lot means ergonomics are important. Comfort is becoming more important. PostNL looks for example at seating position and the routes in and around the vehicles.

Vehicles have an automatic transmission to eliminate gear shifting movements and be easy in use. The transport organization by PostNL recently acquired new box truck type vehicles of which 10 are low entry cab vehicles. PostNL has employees who struggle physically and the low entry cab is a solution to enhance the worker comfort. The only problem is that the low entry cab is not perceived as cool or tough by the drivers. Typically they want larger and more impressive trucks.

PostNL has also looked at Light Electric Vehicles that are as small as possible to be able to reach historic city centers. These vehicles however are not comfortable to get in and out of, which has to be done quite often.

The needs of the drivers are important. This has changed over time. When Eduard Veen started as fleet manager, TCO was the sole focus when buying vehicles. They still look at costs but driver comfort is becoming more important. That is why they decided to change to automatic transmission, added air conditioning and heaters to the vehicles. Since a few years the drivers are made part of the purchasing process and they have developed a route to the new van. During this process PostNL will test ideas for new vehicles with drivers. They test, adapt and then test again to get to a solution which works. When it doesn't, they start over. It depends per branch of PostNL how well this works and how much influence the drivers have. An example of when this process caused some issues is when PostNL changed from Mercedes vehicles to Fiat vehicles for the postal service branch. This time the process had not been optimally arranged and they faced some backlash when the drivers did not like the fact they now had to drive a Fiat instead of a Mercedes. In this case brand perception played a large role in how the drivers reacted to the change. Fiat does not have the same perceived quality that Mercedes has. To prevent future mishaps the drivers were more involved in the purchasing process.

The largest portion of drivers has a standard driver's license. These are the people who do parcel and postal delivery. Larger transport is done by drivers with a truck driver's license because these shipments exceed 3,5 ton in weight.

Not every vehicle that is purchased now is electric. PostNL works with model science based targeting. In this system their target of emission free by 2030 is entered and this model calculates when PostNL should start purchasing electric vehicles. PostNL needs to further develop their charging infrastructure which offers challenges because many of their vehicles are used 24 hours per day and cannot spend enough time charging. For last-mile vehicle this is easier because they can charge at night. A vehicle lasts for 48-72 months which means that PostNL is purchasing their last shipments of vehicles before needing to be emission free. Many of these vehicles are still ICE vehicles, buying them time to construct the needed infrastructure for electric. 2025 will be the turning point for buying exclusively emission free.

The PostNL experience with electric vehicles is with the Fuso E-Canter. These are converted ICE trucks. The BYD vehicles are built as an electric vehicle. The difficulty with electric trucks is their range and maximum weight. The longer the range needs to be the heavier the batteries and the lower the maximum loading capacity is. Charging time is also important because this is time the vehicle cannot be used and therefore costs money rather than turning profit.

However, testing with the Fuso E-Canter shows no major problems. The range of the vehicles seems to be sufficient. The challenge is to rethink the system around electric vehicles, taking into account their charging time and maximum range. It is searching for the right setup. The best solution for electric is everything till 150 km. Currently the last-mile delivery vehicles drive between 20 and 150 km per day. The electric trucks are suitable for last-mile delivery. An advantage is that the vehicles can be charged at the hubs which could save time.

For the BYD T6 a suitable application would be the two-man delivery of larger household items like couches and kitchen appliances. These are vehicles which need a large capacity and have to be able to enter urban areas and cities. Eduard Veen also predicts that the BYD vehicles (T6 & T8) could be suitable for supplying supermarkets in the city.

Being emission free is good for the brand image of PostNL. PostNL is working Co2 reduction using biofuels and becoming emission free by using electric vehicles. They expect that the electric vehicles will become more available and that the vehicles will become more affordable. Eduard Veen expects the TCO of the electric vehicles to match the TCO of ICE vehicles and eventually will become better priced.

The current electric vehicles are similar to the traditional box truck of vans. The limiting factor for the electric vehicles is the battery technology. Eduard Veen envisions

a technology where the platform could be interchangeable or the batteries could be swapped. In this way the vehicles can stay on route charged. Because Ideally the vehicles need to run as much as possible.

For PostNL it is very difficult to have a charger for every vehicle at a distribution center because the peak use of electricity would be too high. This is a logistical challenge for PostNL.

The accessibility of city centers is becoming more difficult but a future with robots, drones or small autonomous vehicles is unlikely in last mile delivery according to Eduard Veen. He states that there will always be a need for personal interaction, someone ringing the doorbell and delivering the package.

Eduard Veen questions the need for personal charging stations. Why are there not third party fast charging stations? “Nowadays with diesel trucks logistics companies do not own their own gas station, why should we have our own charging station for electric vehicles.”- Eduard Veen.

Eduard Veen has seen the BYD T6 at Bleukens Truck & Bus in Breda. The truck looks good on technology level. Eduard Veen compares the T6 with its competitor, the Fuso E-Canter. The T6 seems to have a more spacious cabin. The vehicle feels like an electric vehicle instead of an ICE vehicle. This was lacking in the E-Canter. It does take some getting used to the ‘getting in and out’ procedure. The styling of the vehicle looks good. For PostNL getting the best deal is most important. PostNL is not brand loyal to one brand.

B4 Summary of interview with Wout Zellenrath

Fleet Manager bij DHL Since May 2020

Mr. Zellenrath knows BYD through Bluekens and has seen a BYD truck in Breda in the Netherlands. His first impression is that the truck looks Asian. This might be due to legislations in Asia being different which could impact design because European countries might have different demands. The attention to detail is also not the same on a BYD truck when compared to its competitors. On detail level the truck does not have the same quality. As an example, mr. Zellenrath mentions the windscreen wipers which seem barely attached to the vehicle and exposed wires next to the tail lights.

The design of the truck is different from its competitors and this is positive. It can be useful for companies such as DHL when the vehicle shows it is different and not reliant on an Internal Combustion Engine. DHL wants to show it is using electric technology. The BYD T6 which mr. Zellenrath has seen is sufficiently unique. The BYD T6 could be applicable for B2B delivery by DHL. DHL does not have a 7,5ton vehicle in their B2B fleet yet.

Limitations for electric trucks in B2B are:

- Charging times, fast charging is essential
- B2B vehicles are used during the day and during the night
- Maximum stationary time is 2 – 3 hours per day

DHL
DHL consists of four major branches:

- DHL Parcel – Europe
- DHL Express – Air transport – worldwide
- DHL Supply Chain – Transshipment
- DHL Global Freight – large freight

Mr. Zellenrath is fleet manager at DHL Parcel. At DHL Parcel there is a difference between e-commerce and B2B. E-commerce is a growing market, especially due to the Covid-19 pandemic. Within e-commerce the fleet is solely vans. These are or similar to the Vito and Sprinter models by Mercedes. Within e-commerce only vehicles that can be operated with a standard B driver’s license are used.

For B2B the fleet’s smallest vehicles are 18 ton trucks. De 7,5 ton truck by BYD would be new to the fleet.

Fleet manager
As Fleet manager mr. Zellenrath is responsible for purchasing vehicles. Purchasing is done by the section ‘purchasing’ and the fleet manager. The fleet manager has final say in the decision. Points of consideration are:

- Sufficient cargo space, at least 6 cubic meters.
- Preferred small turning circle
- 150 Km range or more is sufficient
- There are 135 city hubs and the smaller vehicles are charged at night at the hub
- Mostly smaller distances in last mile delivery (e-commerce)
- High demand for electric e-commerce vehicles, 350 eVito vans have recently been ordered
- Safety is important

B | Appendix

Options to improve safety are increasingly important

Electric vehicles are quiet which could cause dangerous situations
Sound effects might improve safety

For B2B the step towards electric driving is more difficult. With purchasing the points of consideration are:

- Sufficient cargo space, at least 15 cubic meters.
- A minimum range of 200 km

Emission target by DHL
DHL want a green fleet. That is the strategy. This means that, when possible, electric vehicles are purchased. Internal combustion engine vehicles are not purchased anymore for the e-commerce branch of DHL. For larger box trucks, especially in B2B transport, the transition to electric driving is more difficult. A solution for now is to look at bio fuels. Currently the limited offer of larger electric vehicles is preventing the electrification of B2B transport.

From 2025 onward, DHL Parcel will be 70% emission free for the first and last mile. Mr. Zellenrath expects that in the Netherlands 100% is manageable.
From 2050 onward DHL Parcel will be completely emission free, as well as the air and ship transport branches.

For the vehicles until 12 ton this means:
- Sprinters – Electric
- Boxtrucks – Electric

For the vehicles above 12 ton this means:
Truck and trailer combination – Hydrogen powered in the future. Only with sufficient charging infrastructure electric would be manageable. At this moment it is still unfeasible or too expensive.

DHL hubs are fitted with charging stations to accommodate the electric vehicles. For each brand the charging system is the same. Only the larger vehicles might need more powerful charging station for fast charging.

Aside from the emission target by DHL, governmental regulations are also important. Many cities are implementing weight limits and emission free zones.

The maximum load capacity is lower with electric vehicles due to heavy batteries.
This is not a problem in e-commerce as the maximum weight is rarely achieved. The load volume is most important. For B2B transport weight is an important factor.

For larger trucks electric driving is unfeasible. A normal internal combustion engine truck can cost around €70.000 whereas the electric equivalent would cost €300.000. Partly because of the cost difference mr. Zellenrath expects the larger long distance trucks to become hydrogen powered instead of battery powered in the future.

Drivers
At DHL there is a difference between delivery men/women and drivers/chauffeurs.

- Delivery men/women have a normal driver's license
- Drivers/Chauffeurs have a truck driver's license

The larger trucks are often used by only one person. The chauffeur uses the same truck every day. The smaller vehicles, such as vans, box trucks and cars are not connected to a person. With purchasing there is no regard for personal wishes or needs. The vehicles are purchased in large numbers and it is impossible to accommodate everyone. The drivers and chauffeurs can give input for the purchasing of new vehicles and input on changes to be made on existing vehicles. The drivers/chauffeurs have a committee for this.

Examples of driver input are:

- Seats from brand A are more comfortable than from brand B
- Connecting truck and trailer needs to be easier (possible with 'Sliding Suzie', a solution for easy connecting)

It is impossible to keep everyone happy but every input is listened to.

Safety
Safety is important for DHL vehicles. To lower the amount of accidents DHL is looking into how safe their trucks are. This is important for both driver as other road users. According to mr. Zellenrath these are a few options which could improve safety.

A rear view mirror or camera. It is difficult to drive backwards or to couple truck and trailer without the possibility of looking behind.
Extra mirrors and camera's, the blind spot often creates dangerous situations
Other safety features such as sensors and warnings, often already offered in cars.

Safety can be the determining factor for purchasing. Mr. Zellenrath states that when a certain brand offers safety options with their vehicles, these vehicles are preferred over a brand without those option. DHL is prepared to pay more for vehicles with safety features.

Visibility
Branding is important. All DHL vehicles have to meet strict rules set by Corporate Branding. However, this is not a factor to consider when purchasing vehicles. Eventually every vehicle can be made yellow and the DHL stickers made to fit each model. DHL is keen on showing that certain vehicles are electric or emission free. Therefore, it is good when a vehicle is recognizably using a different technology.

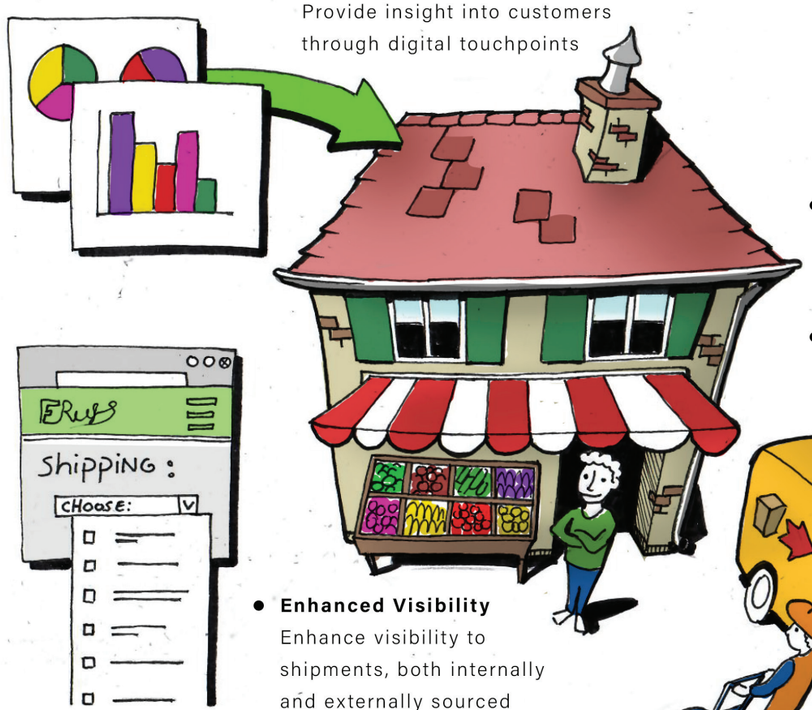
Dealers
The delivery of vehicles goes through dealers. Maintenance contracts are signed centrally as DHL but maintenance will take place at the nearest garage. The electric infrastructure is also centrally arranged. Complete packages with dealer, infrastructure and vehicle all-in-one are not interesting to DHL

The Ideal solution for DHL
A challenge is the accessibility of city centers. More and more cities are imposing weight limits and emission free zones. Therefore, there is a need for:

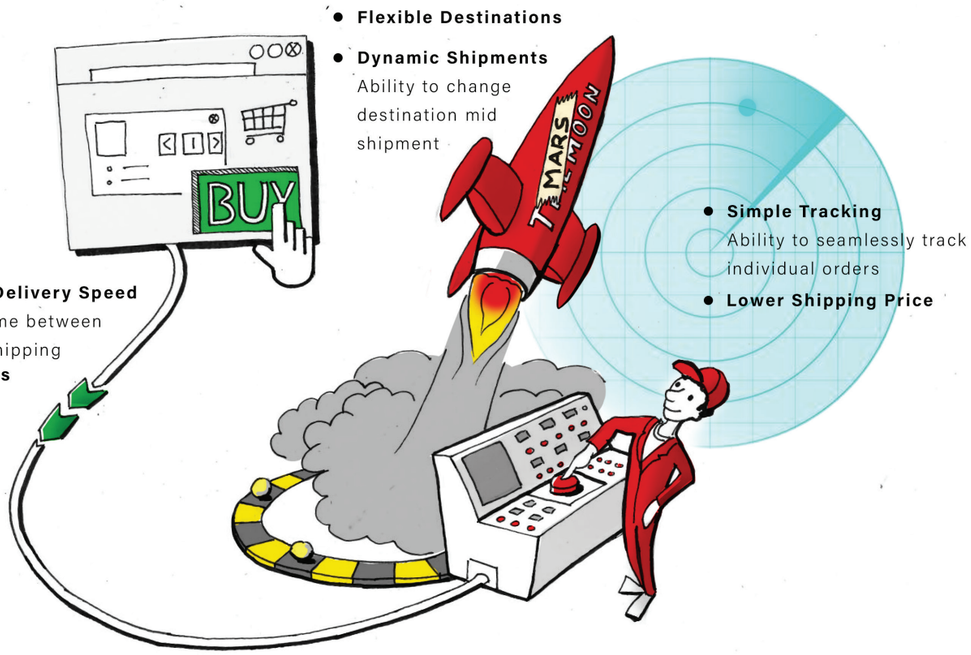
Narrower vehicles, to navigate through narrow passages limiting cars. At this moment only bicycles can do that. A vehicle that can do the same with more cargo would be better.
A way to efficiently transport 6 ton into the city
A moveable hub such as the Rytle concept

For DHL it is important to limit the amount of 'useless km'. Km driven while empty for example.

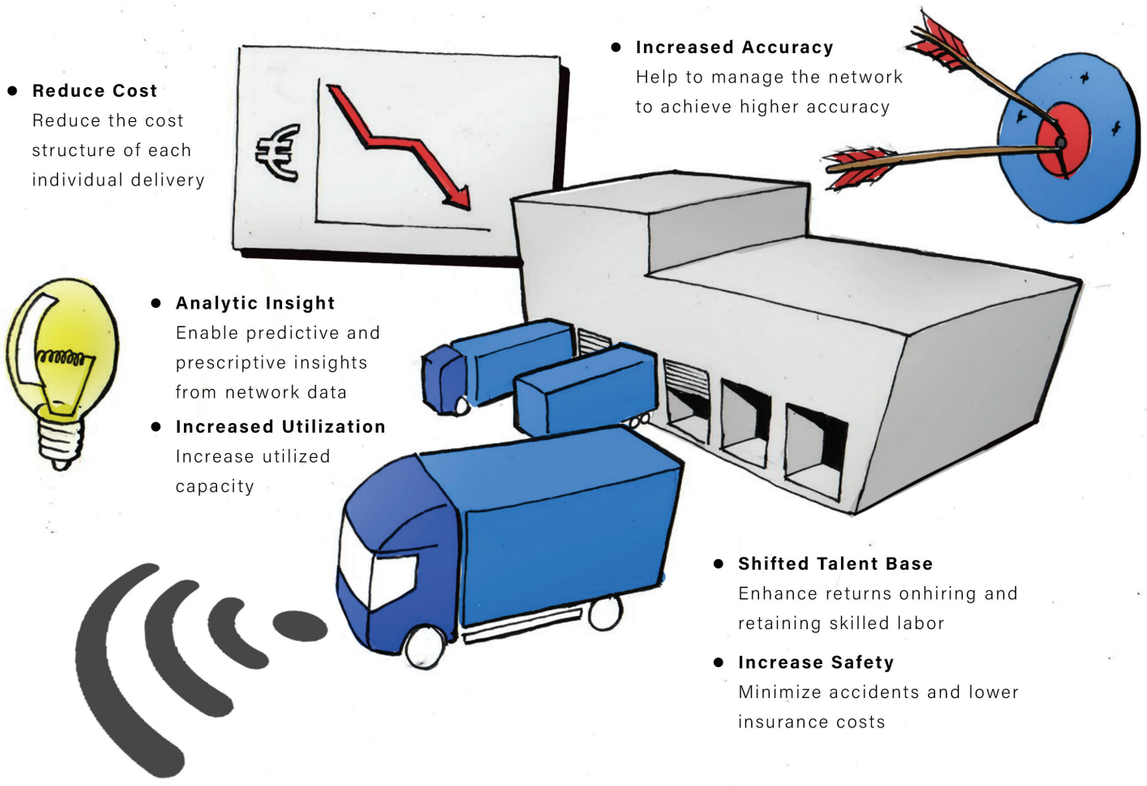
C | Appendix



- **Increased Customer Insight**
  Provide insight into customers through digital touchpoints
- **Distributed Distribution**
  Increase the need for distribution centres near urban areas
- **Shifted Shipping Mix**
  More shipping through third party shipping companies
- **Enhanced Visibility**
  Enhance visibility to shipments, both internally and externally sourced
- **Proliferation of Shipping Options**
  Create need to vary service level, offer more shipping options



- **Flexible Destinations**
- **Dynamic Shipments**
  Ability to change destination mid shipment
- **Simple Tracking**
  Ability to seamlessly track individual orders
- **Lower Shipping Price**
- **Increased Delivery Speed**
  Decrease time between order and shipping
- **Easy returns**



The five levels of automation:

1. **Driver assistance**
   Adaptive cruise control, lane assist.
2. **Partial Automation**
   Controlling speed and steering with driver ready to take control at any time.
3. **Conditional automation**
   Vehicles can drive fully autonomous but require a driver behind the wheel able to take control at any time.
4. **High automation**
   Full autonomous vehicles but only in certain areas.
5. **Full automation**
   Full autonomous vehicles in all road conditions and areas without needing human intervention.

The 5 Levels of Autonomous Vehicles. (2020, January 24). TrueCar Blog. https://www.truecar.com/blog/5-levels-autonomous-vehicles/

Further new logistics business models will emerge – Today, still mostly related to city transport

New logistics business models – Examples

shutl	**Same-day delivery** – *shutl.com*: Realization of shortest delivery times with attractive pricing on basis of a broad network of carriers and partnerships.	cargohopper	**City freight consolidation platform** – *Cargo hopper*: Provision of efficiently bundled shipments through electric transportation vehicles.
VOLVO	**Own car as delivery box** – *Volvo Drop-off/Pick-up System*: Testing of a system that allows consumers to have their shopping delivered straight to their car.	sennder	**Digital logistics agents** – *Sennder*: Digital logistics agent and full forwarding service for entire transportation route. Avoiding different sub-contractors reduces transportation costs. *InstaFreight* follows the same business model.
Routific	**Route optimization** – *Routific*: Smart trucks are navigated by GPS and telematics data to ensure optimized route and capacity utilization.	TRANSFIX	**FTL[1] freight brokerage for shippers and carriers** – *Transfix*: Manufacturers & distributors can connect with a truck driver network shipping long-haul freight across the U.S. Parties are connected by a mobile app.
DHL	**Smart Trucks** – *DHL*: DHL combines advanced technology with dynamic route planning in its vehicles to increase efficiency in both pickup and delivery.	EasyVan GOGOVAN	**Shared logistics concept** – *Gogovan*: Offering of logistics-on-demand, e.g. in Hong Kong – Currently >26,000 registered drivers.
CARGONEXX	**City freight consolidation platform** – *CARGONEXX*: Brokerage service for bundling of shipments from different wholesalers/ manufacturers to serve customers within one specific area.	FreightExchange	**Potential city logistics concepts** – *FreightExchange*: Without a specific time schedule, hitchhiking is the most efficient mean of transportation as operators can sell unused capacity to businesses that need to ship goods.
SENDEN 24	**senden24** offers spontaneous urban instant delivery. For B2B, B2C and C2C. Service available 24/7. Pickup within 5 min. Delivery within 1 hour. On demand. Any place. Any time.	RYTLE	**RYTLE** provides the first holistic and interconnected concept of city logistics. Consists of a unique cargo bike called MOVR, a standardized BOX and a mobile HUB.
SMARTLANE	**Smartlane** is an easy-to-use web-based delivery management software focusing on automated tour planning and optimizing as well as simplified process controlling.	Quiqup Get it now	**Quiqup** is a London-based on-demand delivery company formed in 2014. Founded originally to let consumers order anything for local same-hour delivery, Quiqup has since expanded its proposition to provide last mile delivery to businesses of any size and sector.

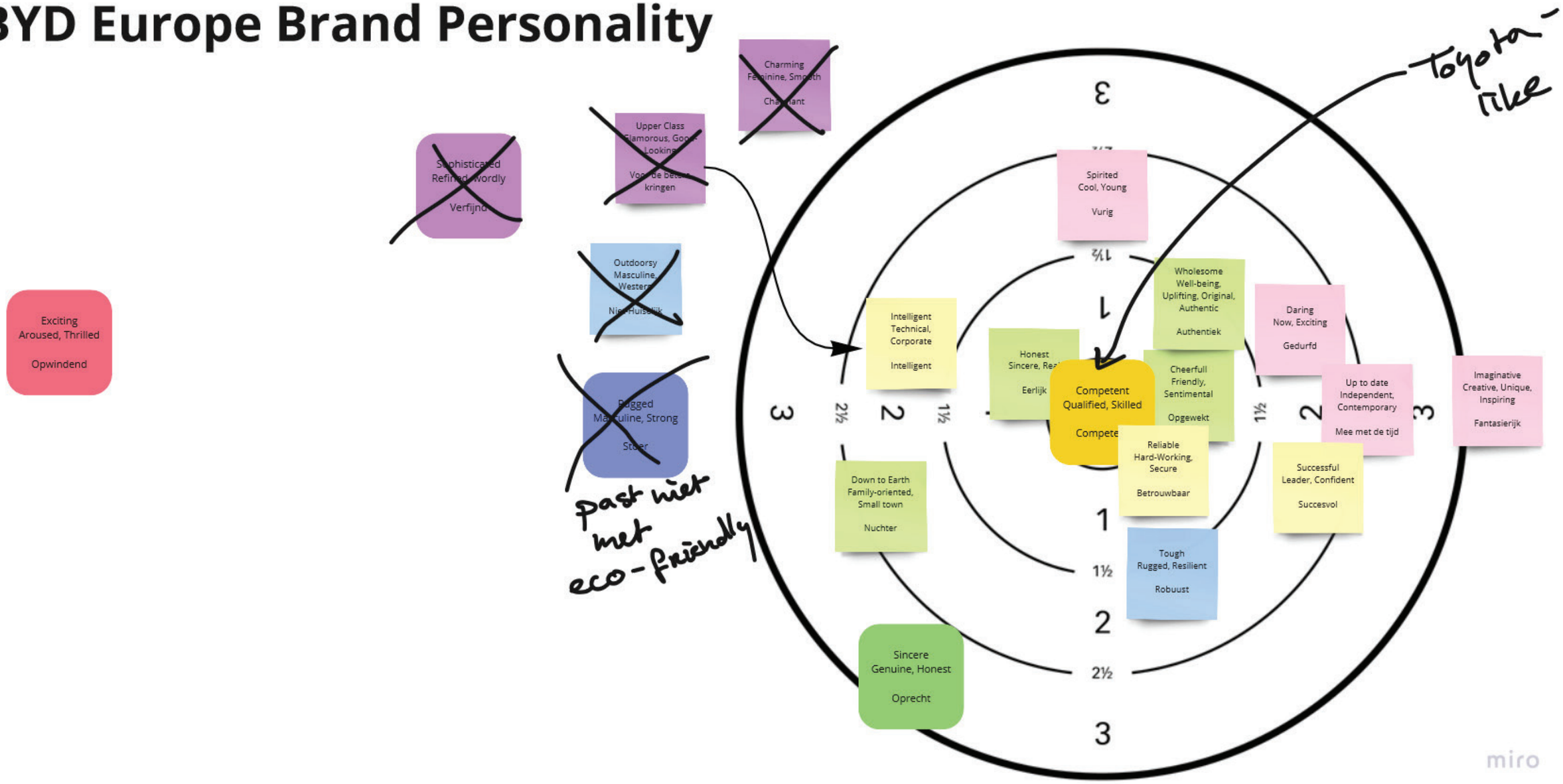
1) Full truck load

Source: Company information; Roland Berger

20180808_Trends in Truck Trailer_fv.pptx

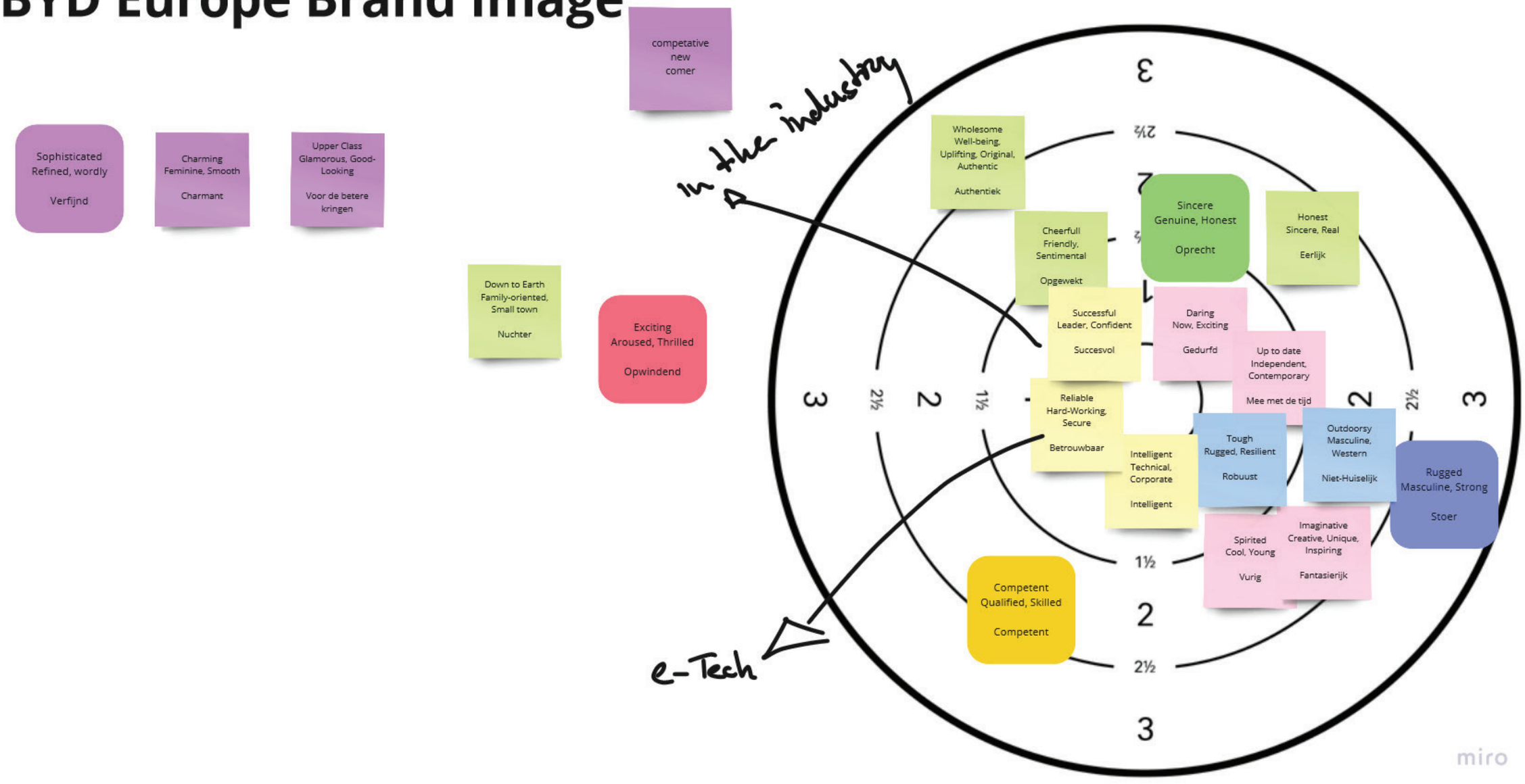
Trends in the truck & trailer market (pp. 5-32, Rep.). (2018). Munich, Germany: Roland Berger.

BYD Europe Brand Personality



E | Appendix

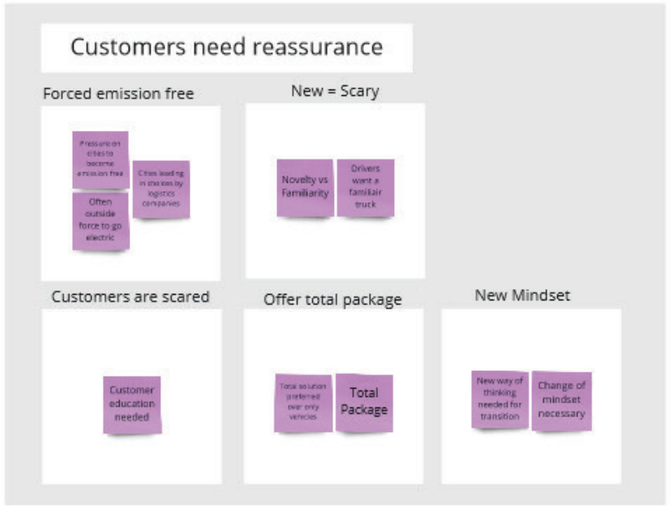
BYD Europe Brand Image

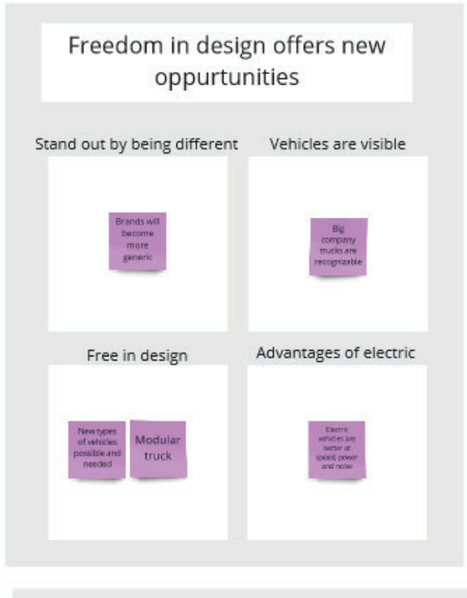


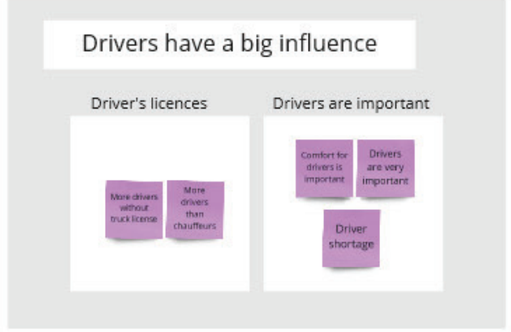
F | Appendix

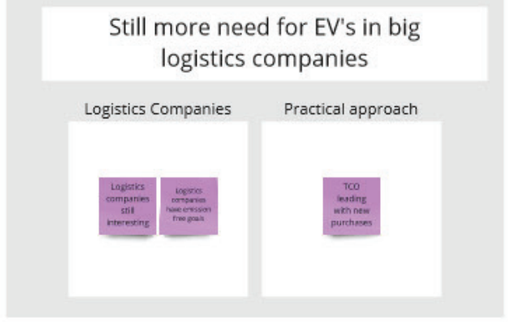

Drivers are important
Comfort for drivers is important
Drivers are very important
Driver shortage
Driver's licences
More drivers without truck license
More drivers than chauffeurs
Safety
Safety more important than electrification
Safety is very important
Safety through autonomous driving
New Mindset
New way of thinking needed for transition
Change of mindset necessary
Forced emission free
Pressure on cities to become emission free
Cities leading in choices by logistics companies
Often outside force to go electric
Last Mile Delivery
Electric is relevant for short haul logistics
Last mile becomes more difficult
Best application for electric is last mile
Focus on smaller companies
Don't only focus on parcel delivery companies
More focus on smaller companies
More vehicles
More electric vehicles in the future
Changing infrastructure due to more vehicles
Inefficient deliveries in cities
Charging infrastructure
Owning infrastructure not necessary
Charging time is important
Infrastructure insufficient
New = Scary
Novelty vs Familiarity
Drivers want a familiair truck
Practical approach
TCO leading with new purchases
Advantages of electric
Electric vehicles are better at speed, power and noise
Stand out by being different
Brands will become more generic
Smaller vehicles in cities
Small retailers require smaller vehicles
Commercial electric vehicles will become smaller
Conflicting needs: bigger for transport, smaller for cities
Free in design
New types of vehicles possible and needed
Modular truck
Offer total package
Total solution preferred over only vehicles
Total Package
BYD portfolio fits partially
BYD Portfolio could fit the european needs
Vehicles by BYD still relevant
Range
Range is important but often adequate
Ability to drive longer distances needed
Customers are scared
Customer education needed
Needs of construction
Construction important market for electric or emission free
Need for vehicles in construction
landscaping companies interesting customer
Many applications for Electric trucks for governments
Last Mile Delivery
Logistics companies still interesting
Logistics companies have emission free goals
Quality important in Europe
Quality perception important in Europe
Vehicles are visible
Big company trucks are recognizable
Autonomous driving as tool
Autonomous driving will be part of logistics
miro

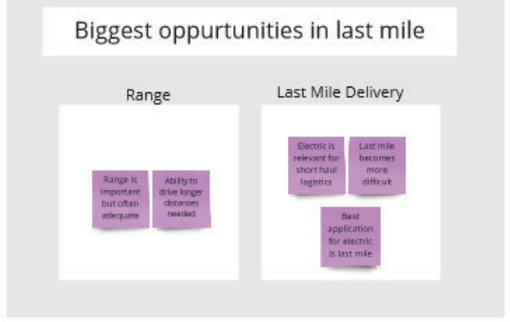
F | Appendix

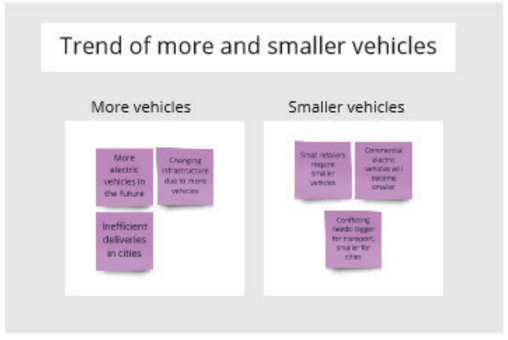


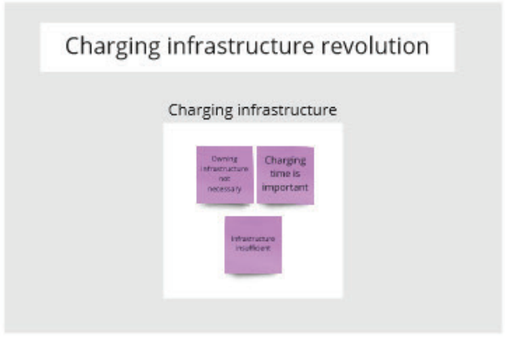


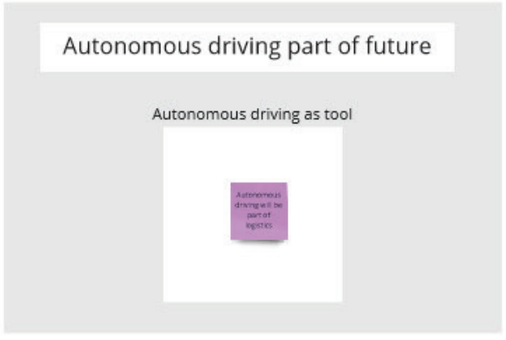






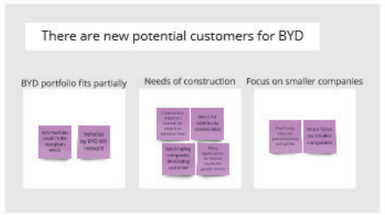


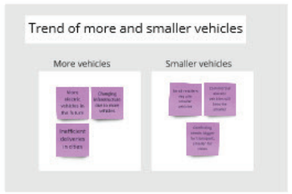




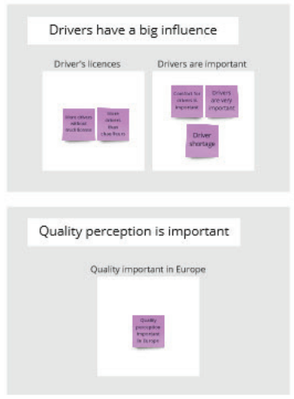
F | Appendix

BYD Portfolio Fit

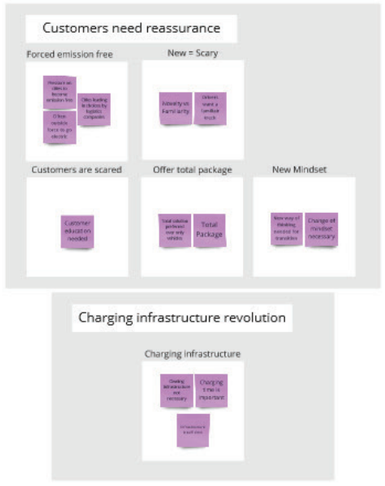




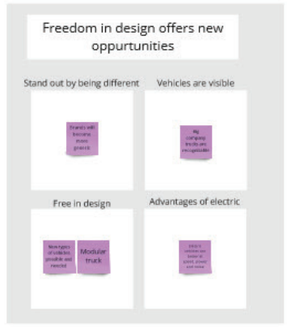
Democratization of European Companies



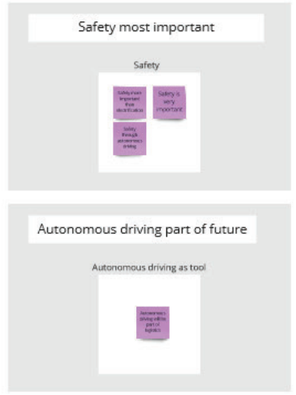
Fear of Transition to Electric



Electric Technology Advantages



Safety

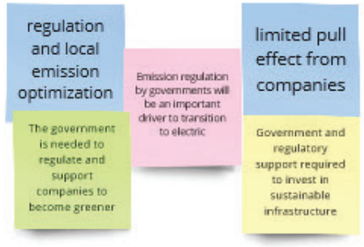


miro

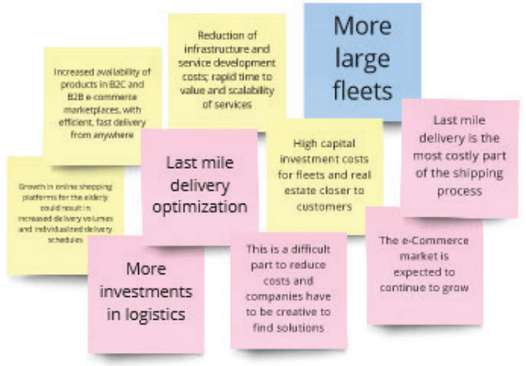
G | Appendix

Electrification of fleets

Government regulations driver to become electric

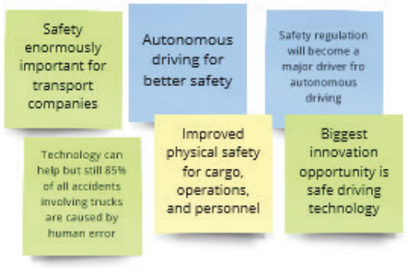


E-Commerce growing market, More vehicles needed

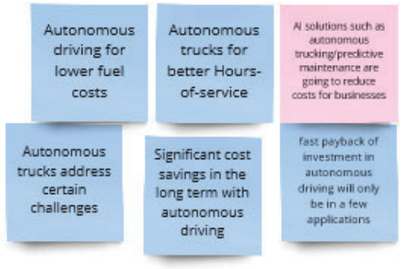


New business models, different kind of vehicles

Safety for drivers and other road users is important



Autonomous driving important solution to many problems



Sharing resources increasingly important

Shortage of drivers

Roland Berger (2018)

DHL Trend Radar, (2020)

PwC, (2019)

IRU, (2018)

G | Appendix

New Business Models

New business models, different kind of vehicles

Sharing resources increasingly important

E-Commerce is Growing Market

E-Commerce growing market, More vehicles needed

Democratisazation of European Companies

Shortage of drivers

Reluctance to Transition to Electric

Government regulations driver to become electric

Electrification Technology Advantages

Electrification of fleets

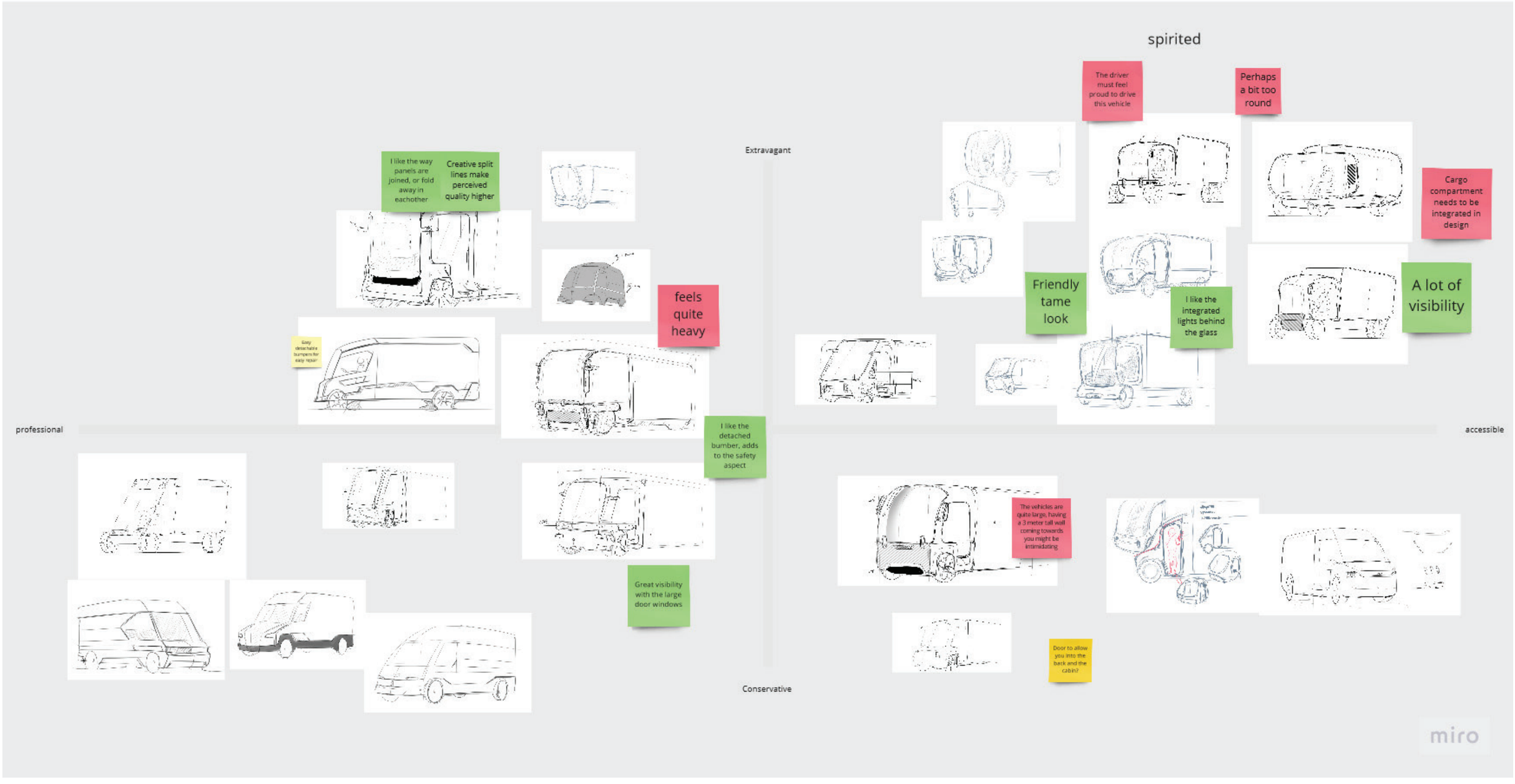
Safety

Safety for drivers and other road users is important

Autonomous driving important solution to many problems

miro

H | Appendix

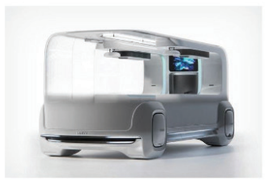

spirited
Extravagant
professional
accessible
Conservative
The driver must feel proud to drive this vehicle
Perhaps a bit too round
Cargo compartment needs to be integrated in design
A lot of visibility
Friendly tame look
I like the integrated lights behind the glass
I like the way panels are joined, or fold away in eachother
Creative split lines make perceived quality higher
feels quite heavy
I like the detached bumber, adds to the safety aspect
Great visibility with the large door windows
The vehicles are quite large, having a 3 meter tall wall coming towards you might be intimidating
Door to allow you into the back and the cabin?
miro

H | Appendix

wholesome (full transparent front)
- "classic" window - nose architecture for this type truck
- transparent (friendly) face

intelligent (dragonface behind glass)

sensible (light weight "origami" architecture)



Design elements study

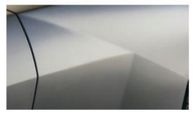
The..... curve/ line..

The..... face....welcoming...

The..... ... lights...claw ...

The.....brand image...

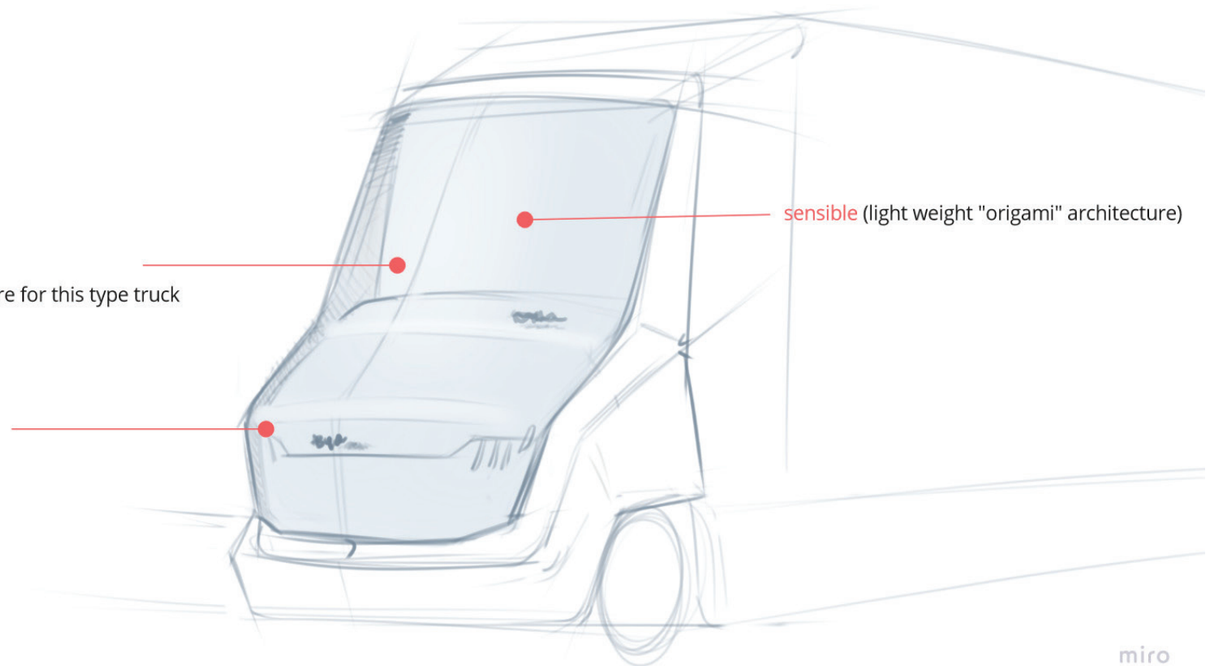
Design elements study



wholesome (full transparent front)
- "classic" window - nose architecture for this type truck
- transparent (friendly) face

intelligent (dragonface behind glass)

sensible (light weight "origami" architecture)



miro

H | Appendix